FEBRUARY, 1945

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TOOL & DIE JOURNAL

TOOLING AND PRODUCTION

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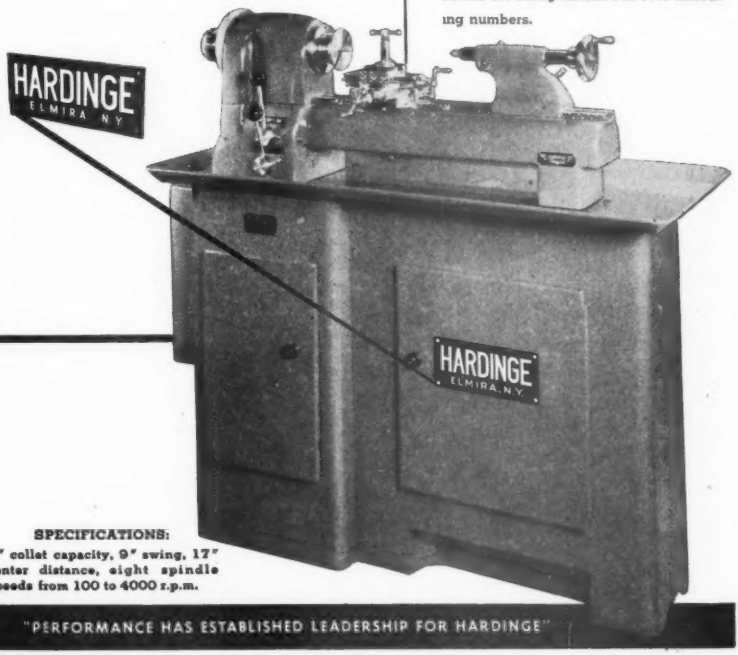


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1" collet capacity, 9" swing, 17" center distance, eight spindle speeds from 100 to 4000 r.p.m.

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# TOOL & DIE JOURNAL


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CHARLES H. HAYNES
DON E. ROOT


★


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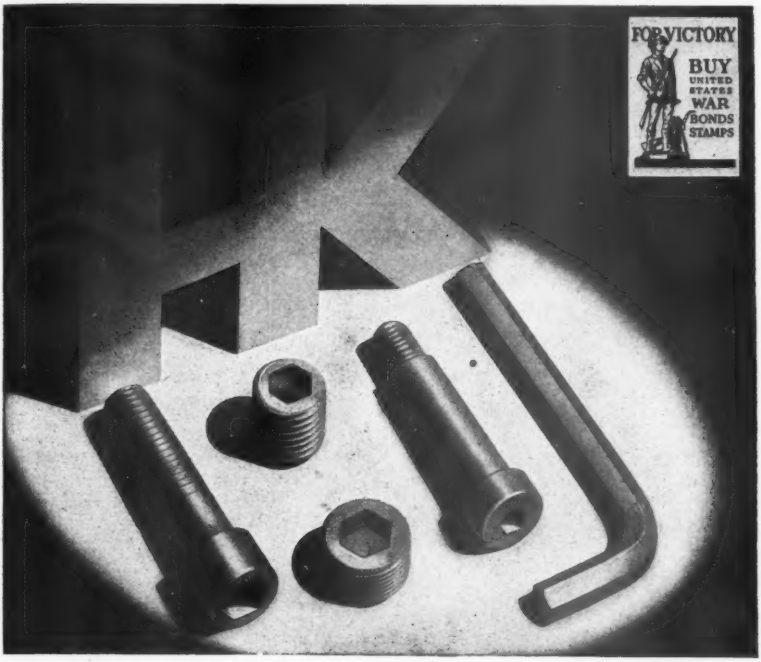
★

# √Completely Cold Forged

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CINCINNATI

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TOOL ROOM AND MANUFACTURING MILLING MACHINES . . . SURFACE BROACHING MACHINES . . . CUTTER SHARPENIN

rise and fall miller
ACCURATELY DUPLICATES PROFILE OF CAM
CINCINNATI
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MACHINES . . . CENTERTYPE GRINDING MACHINES . . . CENTERLESS GRINDING MACHINES . . . CENTERLESS LAPPING MACHIN

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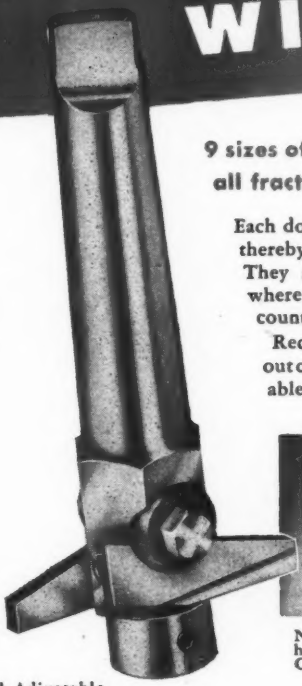
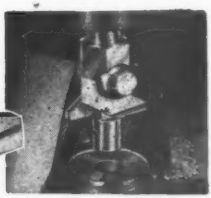
Recommended surface speeds are faster, and without chatter. Exclusive, burr-preventing interchangeable pilots available from $^3/_{16}$" up, by sixteenths.



Clark Adjustable Counterbores are easily expanded. Simply loosen the locking bolts and slide cutting blades in or out. Blades are removable for sharpening.



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A lathe is judged by the kind of job it does, and by nothing else. That one fact explains why Logan Lathes have made such headway. The men in the shops, and the executives as well, *like* the kind of job that Logan Lathes do. Here are four reasons why:

- Advanced engineering in the spindle mounting, in the countershaft, in the back gear arrangement, in the bed construction, and in many other points.
- More exacting standards and closer tolerances are maintained in building Logan Lathes.
- Logan Lathes are built in a new, modern factory, equipped with the best machinery and tooling obtainable.
- A management policy, stressing quality of production rather than volume that has produced a personnel of loyal workers.

*Further messages in this series will give you more reasons why it will pay to see your Logan dealer or get the Logan catalog before you buy a lathe.*

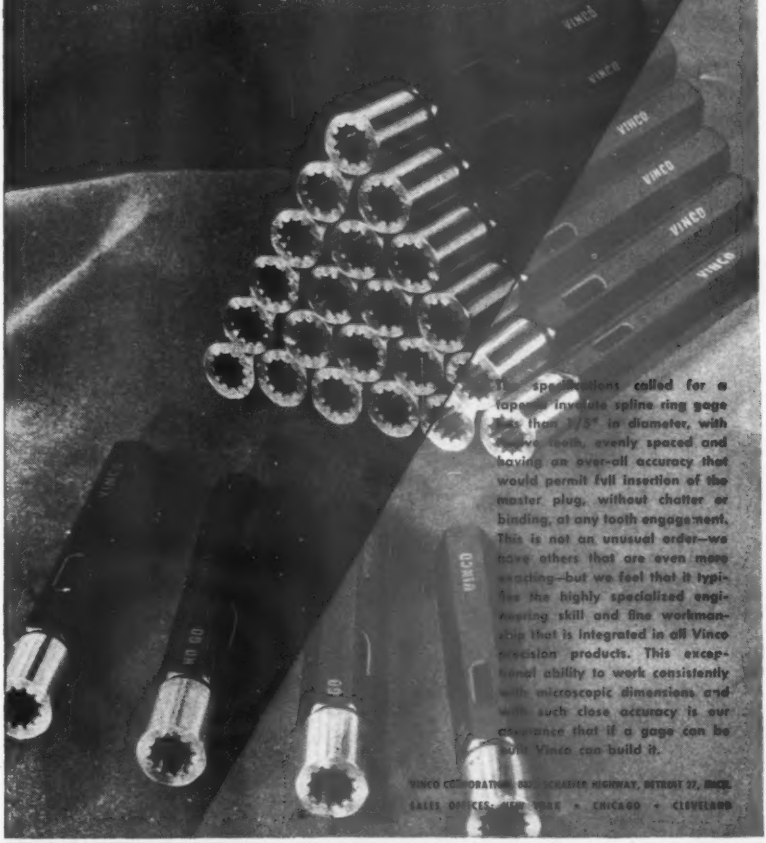
**LOGAN ENGINEERING CO.**

CHICAGO 3-0, ILLINOIS

A-2

**a name to remember when you think of BETTER lathes**

# THESE GAGES WERE NEEDED IN QUANTITY— AND THEY HAD TO BE RIGHT!!!!




The specifications called for a tapered involute spline ring gage less than 3/8" in diameter, with [illegible] teeth, evenly spaced and having an over-all accuracy that would permit full insertion of the master plug, without chatter or binding, at any tooth engagement. This is not an unusual order—we have others that are even more exacting—but we feel that it typifies the highly specialized engineering skill and fine workmanship that is integrated in all Vinco precision products. This exceptional ability to work consistently with microscopic dimensions and with such close accuracy is our assurance that if a gage can be made Vinco can build it.

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**LOGAN ENGINEERING CO.**

CHICAGO 30, ILLINOIS

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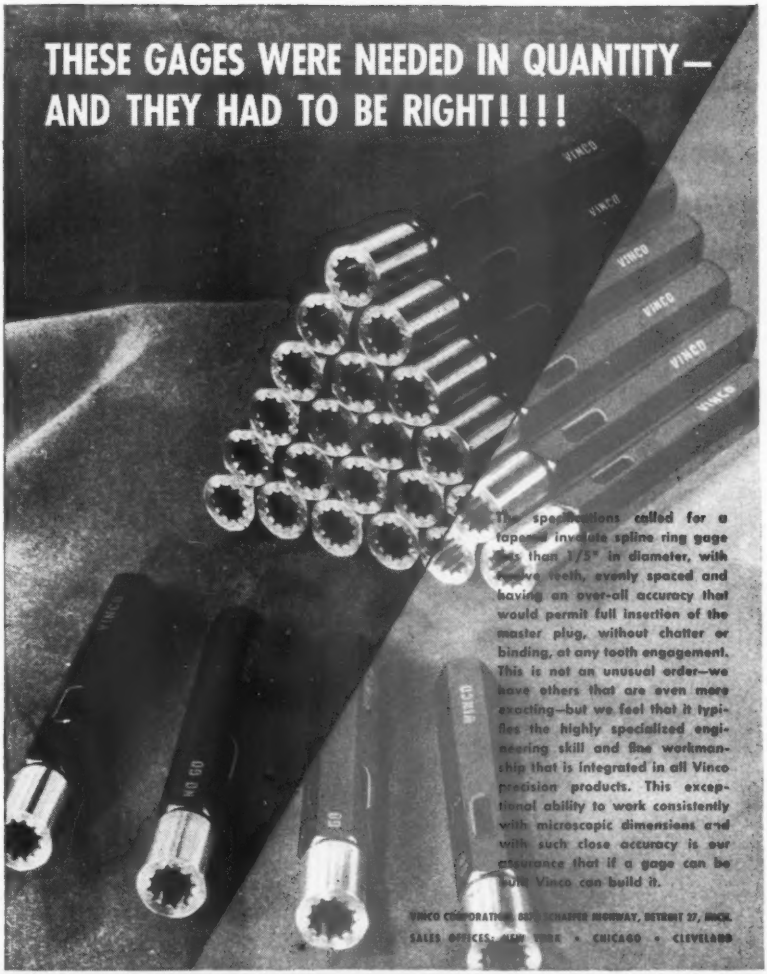
**a name to remember when you think of BETTER lathes**

# THESE GAGES WERE NEEDED IN QUANTITY— AND THEY HAD TO BE RIGHT!!!!




The specifications called for a tapered involute spline ring gage less than 1/5" in diameter, with twelve teeth, evenly spaced and having an over-all accuracy that would permit full insertion of the master plug, without chatter or binding, at any tooth engagement. This is not an unusual order—we have others that are even more exacting—but we feel that it typifies the highly specialized engineering skill and fine workmanship that is integrated in all Vinco precision products. This exceptional ability to work consistently with microscopic dimensions and with such close accuracy is our assurance that if a gage can be built Vinco can build it.

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McKinney has the skilled personnel and specialized facilities to handle all or part of your tool engineering—with background

CO... ENGINE...

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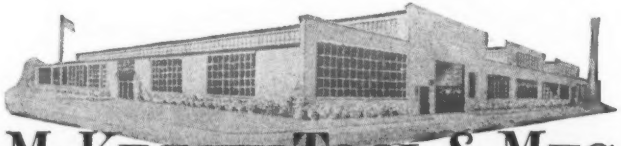

# THE McKINNEY TOOL & MFG. CO.

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DESIGNERS AND BUILDERS OF PRECISION TOOLING SINCE 1920

JIGS · FIXTURES · GAUGES · MACHINERY AND CUSTOM MACHINING

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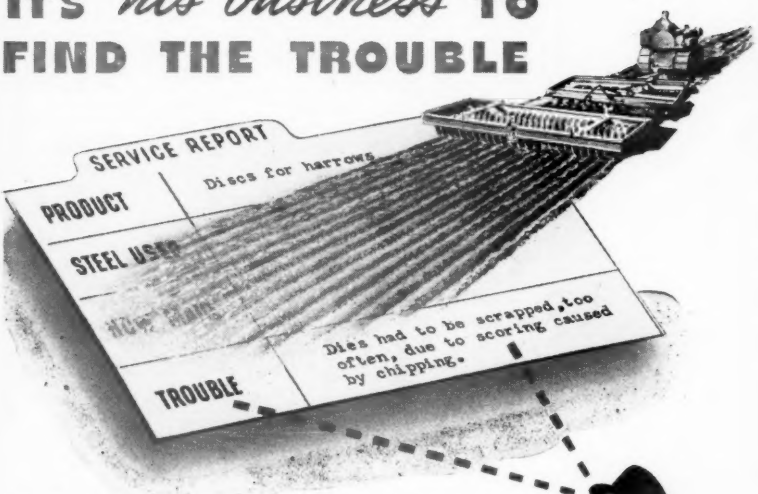


The discing of the land is an important step in growing the world's food supply. The making of these discs is equally important to those whose business it is to manufacture them as economically as possible.

What has this to do with Latrobe's Metallurgical Service? Simply this: Recently, a manufacturer was confronted with a problem that involved the dies from which such discs were made. The discs were carbon steel, in the "as rolled" state, .90 to .158 thick. The dies were 18" O.D. x 16" I.D. x 4" thick. These dies were failing because of sinking, and the resultant chipping scored the dies full length, making it necessary to scrap them.

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• • • •

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*Latrobe* ELECTRIC STEEL COMPANY

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S-1

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VARD threaded plug gages are accurate. Each gage is carefully ground from special gage steel. Gage threads are all hand lapped and polished, after which each gage is minutely checked for diameter, thread form and lead on some of the world's most accurate visual and mechanical testing machines. One of these, the Pratt and Whitney lead tester, checks the lead to an accuracy of .00001-in.

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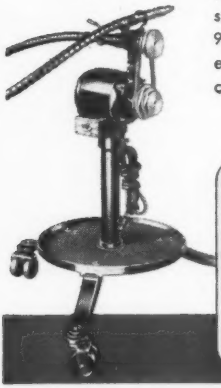
ARMY E NAVY

**VARD INC.**
PASADENA 8, CALIF.

# Save these for work a machine can't do



**HC-5**—½ H. P., multi-speed countershaft unit, 900 to 3600 R. P. M. Mounted bench-height on 3-leg caster base, 360° swivel.

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*Flexible Shaft*
EQUIPMENT
More VERSATILE Machines for More PROFITABLE Work

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## Not All Men and Machines Can Be Released When the War Ends... Some Must Stay on the Job!

When the war broke out, *Knock-Out* Tool Grinders were ready! They've been doing a Titan's job on production work and on tool maintenance throughout the nation and all allied countries. Now as the peace approaches, and thinking men are readying their plants for the tremendous production job which lies ahead, *Knock-Out* Grinders are again ready to accept the challenge!

*Knock-Out* engineers have continually stayed on the alert giving users of K-O Tool Grinders many advantages, making difficult grinding jobs easy.

Single Speed or Multi Speed Wheel Heads are available. Wheels ranging from 1 to 10 inches can be used. Tools from the smallest to 12 inches in diameter can be ground with speed and accuracy.

When writing for literature ask for Unit No. 36-25

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## DOUGLAS PRECISION MILLER

### PRODUCTION • TOOL ROOM • MODEL SHOP

32" x 8" working surface of table. Wide range of spindle speeds and reversible feeds to choose from for all materials and all accuracy requirements.

A handy machine of well balanced design, which proves its worth in the shop for precision milling.

Universal Milling attachments and dividing heads are available to increase the scope of operations.

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PROMPT
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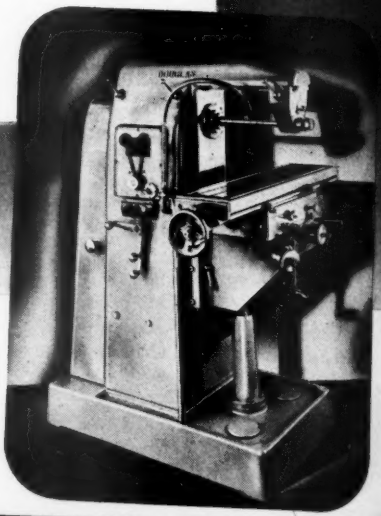
*Full universal milling attachment arranged for 6 speeds of 375-5000 r.p.m.*

*Dividing Head and Tailstock—6½" Swing Precision Dividing Head and Tailstock. Ratio 40:1.*



## Douglas Machinery Co., Inc.

15

# For Precision Grinding and Sharpening

## ROTOREX UNIVERSAL GRINDER

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8" x 15" capacity. Variable spindle speeds ranging from 4500 to 6000 r.p.m., making the machine flexible and particularly suitable for delicate grinding jobs. Readily interchangeable attachments for single purpose jobs such as cylindrical, internal, and radius grinding, makes the Rotorex Grinder a universal machine for all kinds of grinding and sharpening operations.

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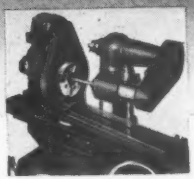

*Internal Grinding Attachment — Will grind holes, straight or taper, from ¼" upward and 2" in depth with standard quill.*

*A Wide Variety of Milling Cutters—With spiral teeth, side and face milling cutters, end mills, angular cutters, radius cutters, gear tooth cutters, etc.*

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**CARBURIZATION**

No-Carb prevents carburization in selected areas when applied to clean surfaces of low-carbon steels.

**DECARBURIZATION**

No-Carb prevents decarburization when used on finished high-speed tools, or on bars or billets of high-speed steel.

**CAN BE APPLIED BY:**

Park's No-Carb prevents undesired carburization and decarburization when applied with brush or spray gun on clean metal surfaces.

There is a definite advantage in using No-Carb, because on most jobs it can be applied by brushing or spraying directly from the can after stirring—there is no time wasted in adding to or diluting No-Carb

No-Carb is removed from bars and billets by the rolling mill, while sand blasting or immersion in a boiling solution of ammonium bifluoride (10-50%), in a wood, or lead or copper lined, tank will remove No-Carb from finished parts or tools. If you are looking for a liquid paint to do a better job of preventing carburization or decarburization it will pay you to try Park's No-Carb—a sample will be sent to you upon request.

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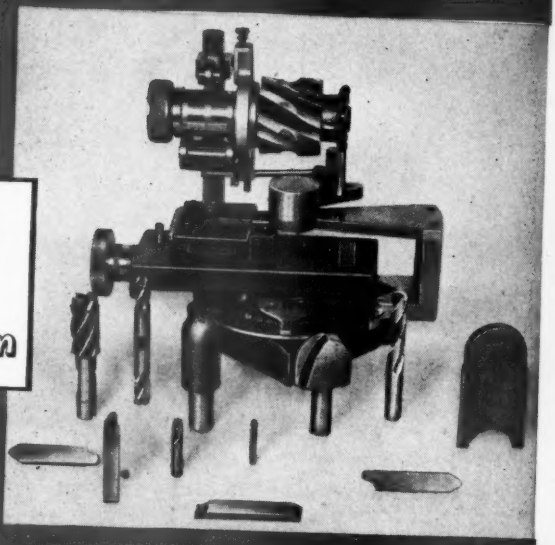

**MEYERS**

**Radiform**

TRADE MARK REG.

Meyers Radiform set up to generate a radius on a helical slab ...

Also pictured are a few standard cutting tools which in less time made by "generating" on the Radiform.

## GENERATES CUTTING TOOLS TO ACCURATE TOLERANCES

The Meyers Radiform is unlike any other machine on the market in that it is adaptable to so many different grinding operations. Predetermined radii can be *accurately* generated on tool bits, milling cutters, end mills, drills and die sinking tools in less time than by any other method.

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## SPEED PRODUCTION

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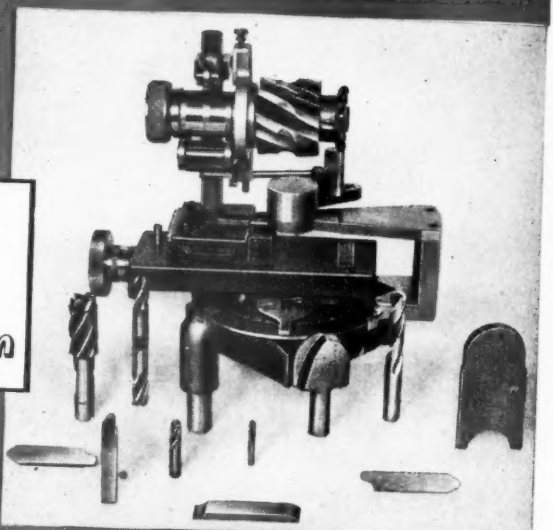

Meyers Radiform set up to generate a radius on a helical slab mill.

Also pictured are a few standard cutting tools which have been made into "specials," on the Radiform.

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The Meyers Radiform is unlike any other machine on the market in that it is adaptable to so many different grinding operations. Predetermined radii can be *accurately* generated on tool bits, milling cutters, end mills, drills and die sinking tools in less time than by any other method.

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THE EVENING NEWS

FINAL

# RECONVERSION PROBLEM SOLVED!

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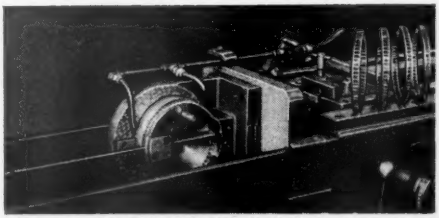
ABOVE: *Standard American H-2-30 Horizontal Broaching Machine reconverts easily from war to post-war production.*



*Close-up view of set-up described at left, showing bearing cages in various stages of completion.*

This standard *American* broaching machine, designed for use in many types of war production, is cheaply and quickly converted to peacetime manufacture. Considerably less expensive than especially built equipment, it will perform a large number of "special" jobs accurately and economically.

The set-up for one such job is illustrated at the right: To broach rectangular holes in aircraft bearing cages. Two opposite holes are broached at each pass. Starting with a drilled hole, three passes, each with a slightly larger broach, are required for each hole. Exceptional finish at a high production rate is assured.

*American's* complete broaching service—machines, tools, and engineering—is available to speed your production. Let *American* engineers help solve your precision manufacturing problems with standard machinery that will save you valuable time and money. Write for further details.

Use proper and sufficient lubrication when broaching. It is cheap life insurance for broaching tools.

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for smaller machine tools requiring less than 1 hp

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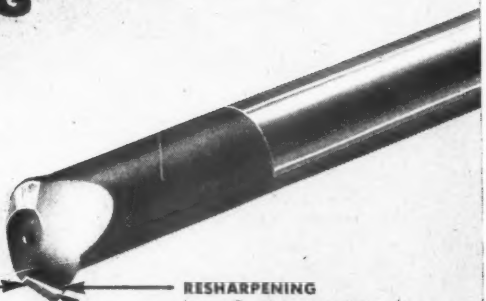
# BOKUM BORING TOOLS



**HELICAL RELIEF** maintains constant clearance angle

**RESHARPENING** is confined to one face

**FINISH LAPPED** cutting surfaces produce better bores with faster feeds

The cutting edge forms an angle which will always cut free because of the special helical backed-off form of the front end of the tool.

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*Style A* Tools (shown above) are for boring through holes—made in sizes small enough to bore ⅛" holes, to sizes husky enough to bore extremely large holes.

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*Style C* Tools are for internal threading from 7/32" dia. up.

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Di-Acro Brake forms non-stock angles, channels or "Vees." Right or left hand operation. Folding widths: Brake No. 1—6". Brake No. 2—12". Brake No. 3—18".

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It illustrates many stampings or parts made without dies, gives full details on DI-ACRO machines and shows how they may readily be adapted for various applications. Request your copy now.

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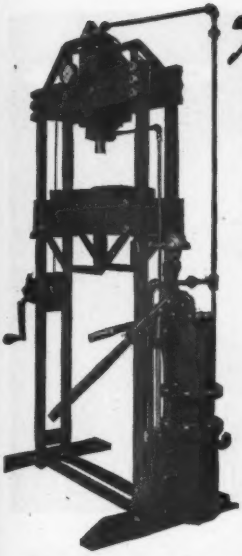
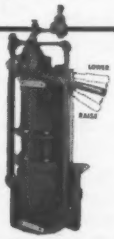


# *The* KRW HYDRAULIC ARBOR PRESS IS AN *Efficient* PRODUCTION MACHINE

**EQUIPPED WITH PATENTED KRW SPEEDI-BOOSTER AND USING LOW-COST DIES, IT DOES THE WORK OF EXPENSIVE PRESSES AND BENDING MACHINES ON SHORT-RUN PRODUCTION**

● If you could see some of the manufacturing uses to which KRW Hydraulic Presses are being put today, you'd doubt your eyes. Nevertheless, the versatility and adaptability of these air-operated presses is being profitably proven today by many factory and production executives. Heart of the New KRW Speedi-Booster Hydraulic Press is its sensitive finger-tip control mechanism which instantly governs ram movement . . . lower, raise or stop. With a few simple and inexpensive dies these KRW Presses can be adapted to a wide variety of bending and pressing operations requiring pressures from 5 to 75 tons. Air pressure varying from 80 to 225 pounds is required . . . resulting hydraulic pressure varies with air pressure used. Built-in air regulator permits exact duplication of pressure at each stroke . . . important in many types of fast production. Available for either vertical or horizontal operation. Quick delivery on all sizes. Write for KRW Hydraulic Press Bulletin. Our Engineers are at your service. We also manufacture suitable capacity air compressors. K. R. Wilson, Dept. 18, 215 Main St., Buffalo 3, N. Y.

**1/8" CRS RING.** With the simple dies shown, quickly made from stock steel, this 6-inch ring is made with but four feeding passes into the lower die. Before the radius is completed, the shackle is inserted into the die notch, permitting the ring to "thread the eye" of the shackle. Closing ring by welding completes operation. Equipment: 25-ton KRW Press.

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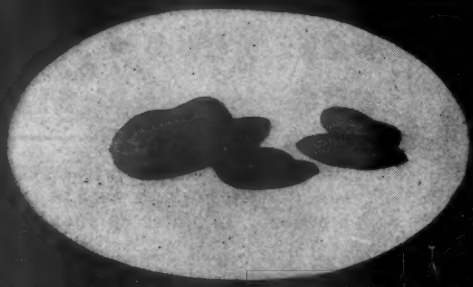

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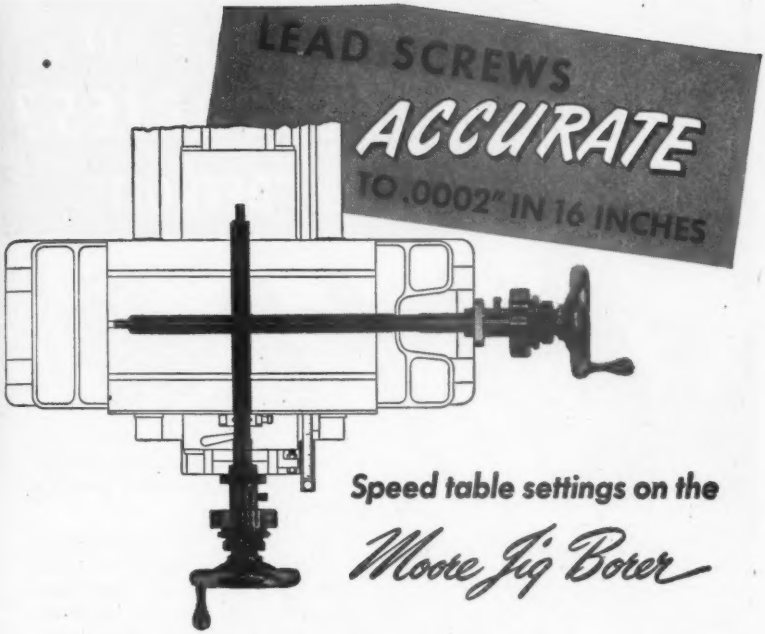


**Speed table settings on the**

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Accurate lead screws built into the Moore Jig Borer *mechanically* guide the work to precise location within .0001" *at a turn of the micrometer dials.* This exclusive principle in Jig Borer construction reduces the margin of human error on table settings and simplifies operation. The built-in accuracy of the lead screws also assures *constant* precision, unaffected by the temperature fluctuation encountered in the use of exposed size blocks or end measures.

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for grinding milling cutters and other multiple tipped tools

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for segmenting carbide bars into convenient sizes for tipping special tools

FELKER DI-MET
TYPE D6WHC Straight Cup Wheels

for grinding straight shank tools

FELKER DI-MET
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for grinding chip breaker grooves in straight shank tools

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# Why Accountants Like the Nichols Miller

He may not know a milling machine from a centerless grinder. But your accountant, because he keeps a watchful eye on the profit side of your production ledger, can appreciate the advantages of a machine that *quickly pays for itself*...the Nichols Miller.

Extra-utility is basic in the Nichols Miller's design. Starting with the fundamental principle of bringing the cutter on a sliding head down to the work, W. H. Nichols & Sons has engineered around it a machine tool that maintains *toolroom tolerances* in high-speed production, yet is sturdy enough to take on heavy duty jobs as well.

Simple, inexpensive fixtures and quick set-up keep Nichols Millers humming even in semi-skilled hands, through an extensive range of milling, boring, turning and facing operations.

Lathe carriage flexibility is an added production feature made possible by the Lever-Rack and Pinion Transverse feed, an exclusive Nichols development.

Equally at home in toolroom, laboratory or on the production line, the Nichols Miller is a profitable "operator." And you'll be surprised at its low initial and maintenance costs.

Our new photographic brochure will show you some of the many ways it can work for you. Write for it today.

**THE NICHOLS MILLER**

"THE MILLER THAT USES ITS HEAD" • MFD. BY W. H. NICHOLS & SONS, WALTHAM, MASS.

NAT'L DISTRIBUTORS: NICHOLS-MORRIS CORP. • 44 CHURCH ST., NEW YORK 7 • *Dealers in all principal cities*

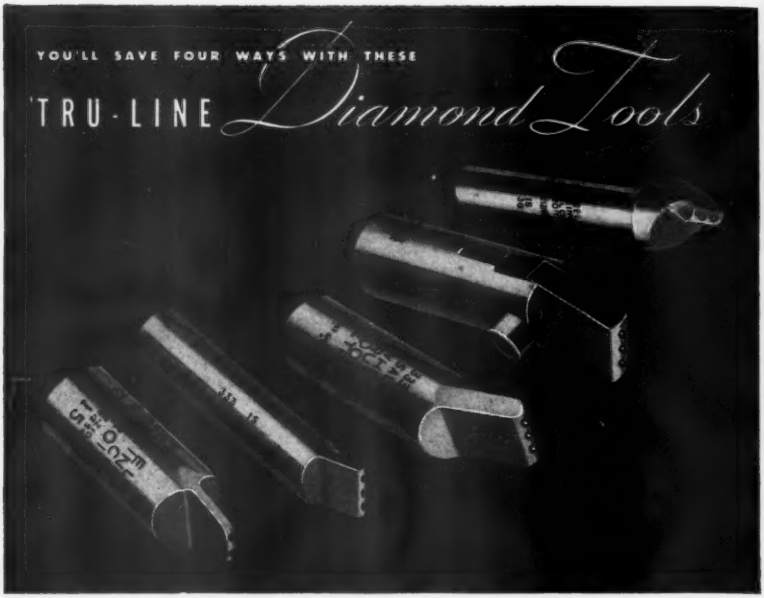
# Allison
## COLLET CHUCKS

Allison model #3 for 2½" spindles and under—with 1⅝" collet capacity has full circular low pressure cam that activates the collet closing mechanism, eliminating any possibility of stock slippage.

Above is model #1 for 1½" 8-thread spindle lathes—with ⅞" collet capacity.

Allison TOOL & ENGINEERING COMPANY
4031 Whittier Blvd., Los Angeles 23, Calif.

WRITE FOR NEW ALLISON CATALOGUE — SEE YOUR LOCAL DISTRIBUTOR




TRU-LINE multiple diamond tools require no turning. Machine down-time is reduced, production increased.

Diamonds are set in overlapping rows, providing a continuous and efficient cutting surface for the life of the tool—without changing, re-setting or adjusting.

Matrix forms a chemical bond with the diamonds, holding them securely until entirely used. Thin blade dissipates heat, safeguards the diamonds.

The effective use of smaller, carefully selected, high quality diamonds permits much lower diamond tool costs, yet assures efficient cutting.

TRU-LINE multiple diamond tools have consistently demonstrated their ability to deliver these four kinds of savings under all conditions of use on vital war material where speed, accuracy and finish are important factors. On many jobs they have completely replaced ordinary diamond tools.

There is a TRU-LINE tool for every type of straight, profile or step-dressing operation.

**Send For This Book**

It gives complete information on TRU-LINE tools, shows how they save time and money. Your copy gladly sent on request.

**WHEEL TRUEING TOOL COMPANY**

3200 W. Davison Avenue
Detroit 6 • Michigan

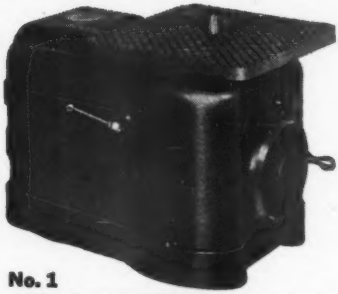
575 Langlois Avenue
Windsor, Ont. • Canada

# BOYAR-SCHULTZ PROFILE GRINDERS

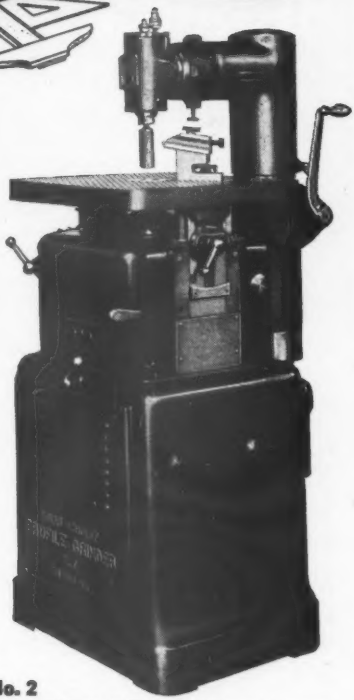
## Vital Tools for Making the Tools of Production . . . . . .

**WITH the coming change from "all out" production for war to production for fast growing peace-time needs, machines for making the tools of production are more and more important.**

**Boyar-Schultz Profile Grinders have long been recognized as vital tools in the tool and die shop. They are built for economically grinding and finishing irregularly curved surfaces and odd shaped contours so frequently encountered in making dies, punches, templates, cams and special machinery.**



**No. 1**
**PROFILE GRINDER**—a bench size tool operating at 20,000 R.P.M. For grinding and regrinding die clearances, sharpening punches, and economically grinding cams and templates.

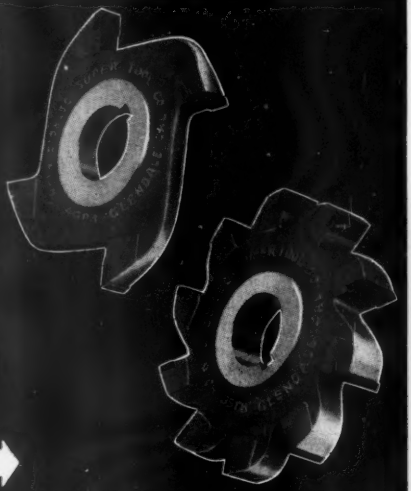


**No. 2**
**PROFILE GRINDER**—with two independently powered spindles operating at 10,000 R.P.M. with vertical oscillations. Stock is rapidly removed, even with wheels of small diameter.

**BOYAR-SCHULTZ CORPORATION**
**2112 Walnut Street** **CHICAGO 12, ILLINOIS**

# Again-

## DOWN GO PRICES ON SUPER Milling Cutters



SUPER has done it again! For the second time in less than a year, prices on Super Carbide Tipped Milling Cutters have been reduced! And it is a big reduction, too . . . again made possible because of an increased demand for these fast, economical cutters that has resulted in increased production and greater manufacturing economies. Write TODAY for a price list showing these new low prices. Then you'll want to place your orders immediately for these Super Carbide Tipped Milling Cutters that now, more than ever, will step down your costs while they are stepping up your production.

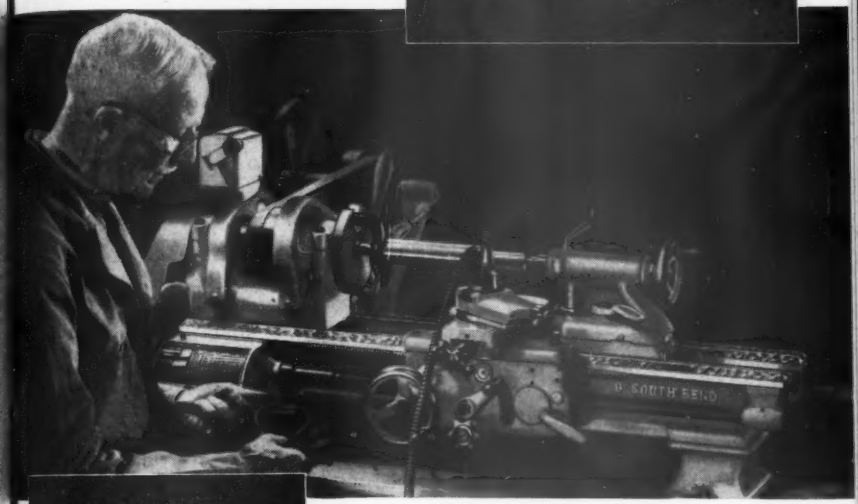
**SUPER TOOL COMPANY**

*Carbide Tipped Tools*

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

# 9 INCH
# SOUTH BEND
## *Precision*
# LATHE

. . . . . FOR THE MANUFACTURE OF SMALL ACCURATE PARTS IN PRODUCTION SHOPS . . . FOR PRECISION OPERATIONS IN TOOLROOMS, EXPERIMENTAL SHOPS, AND LABORATORIES



### 9 INCH MODEL A
### LATHE FEATURES

Fine workmanship by experienced craftsmen.

Superfinished spindle with large bearings.

Direct belt drive to spindle for smooth operation at high speeds.

Back-geared drive for heavy cuts and low spindle speeds.

Full quick change gear box.

Thread cutting range — 4 to 224 per inch, 48 pitches.

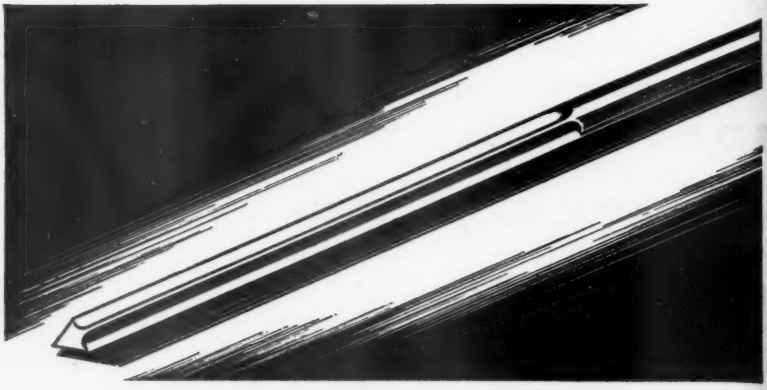
Whether your problem is the quantity production of small, accurate parts or the efficient machining of small work in the toolroom, experimental shop, or laboratory, you will find a lot of possibilities in the 9-inch South Bend Lathes. Modern in design, built with the same care as the larger sizes of South Bend Lathes, they are fast, accurate, and versatile. Substantial savings in capital investment, power consumption, floor space, and labor costs have often resulted from their installation.

In addition to the 9-inch Lathes, we manufacture 10″, 13″, 14½″, and 16″ lathes in Quick Change Gear and Toolroom types. Also the Series 900 and Series 1000 Precision Turret Lathes having ⅝″ and 1″ collet capacity respectively. Write for a catalog, stating the size and type of lathe you need.

*Lathe Builders For 38 Years*

**SOUTH BEND LATHE WORKS**

**432 E. MADISON STREET • SOUTH BEND 22, INDIANA**



# Industry is Buying the Reamers
# GROUND FROM THE SOLID HEAT-TREATED BAR

**Orders for L & I Ground Flute Reamers are pouring in faster than ever—as America's production specialists discover their superiority—in cutting edge, production performance and long life.**

**Reamers were just reamers—before L & I started grinding them *from the solid bar* after that perfect heat-treating agent, the round bar, had been hardened. The new result was extra, uniform hardness and uniform cutting edges that do their work faster and cleaner and *longer*. L & I Ground Flute Reamers are making production records. Why not let them improve your results and save your money?**

**Send us a trial order—or write for illustrated price list on L & I Ground Flute Reamers.**

**L&I GROUND FLUTE REAMERS**

**LAVALLEE & IDE, INC. CHICOPEE, MASS.**

NORBIDE* POINTS *the way to*
*Increasing Dial Indicator Gage Life 100 times*

**NORBIDE Tips for dial indicator gages are extremely wear-resistant, will not scratch and will not become charged with particles of metal. For NORBIDE (the trade-mark of Norton Boron Carbide) is the hardest material made by man—second only to the diamond in hardness. This explains the extraordinarily long life of NORBIDE plug, ring, snap and keyway gages and dial indicator gage points.**

**NORTON COMPANY** **Worcester 6, Mass.**

*Hardest Material Made by Man

# Friction Sawing with Tannewitz HIGH SPEED BAND SAWS

## Trimming formed parts . . . Cutting Sheet Steel, 1-inch Armor Plate, Plastics or what have you . . .

Write for Your Copy

"The process is to some so spectacular that they refuse to believe their own eyes, *and so safe, a woman can operate the machine.*" So writes the chief tool research engineer for one of the largest aircraft corporations. Previous cutting costs are radically reduced, difficult and slow cutting of certain materials made swift, easy and safe. By all means write for your copy of "FRICTION SAWING" by Arthur A. Schwartz, Chief Tool Research Engineer, Bell Aircraft Corp., which will soon be off the press. It's free.

**THE TANNEWITZ WORKS** GRAND RAPIDS 4, MICHIGAN

# SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

1. Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
2. Saves time and expense of drawing or tempering small metal parts in large furnaces.
3. Cuts handling time when normalizing or annealing small parts. No waiting.
4. Conveniently available for pre-heating for subsequent high-speed hardening.
5. Eliminates shut downs and delays in servicing emergency repair orders.

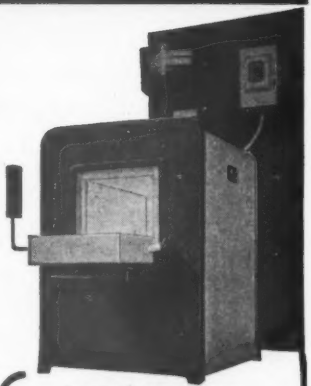
## AVAILABLE IN TWO SIZES

| *Type* | *Chamber Capacity* | *Amps 115 V* | *Watts* | *Amps 230 V* | *Price* |
|---|---|---|---|---|---|
| MH-3 | 8″W 6″H 14″L | 29.6 | 3400 | 14.8 | $124.00* |
| MH-4 | 10″W 6″H 18″L | .... | 4800 | 20.9 | $191.00* |

**Includes Hearth Plate*

**MAX. SAFE TEMPERATURE**—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

**AUTOMATIC CONTROL**—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$152.40.



## REPLACEABLE HEATING ELEMENTS

Replaceable nickel chromium resistors embedded in rectangular refractory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel—furnace structure remains undisturbed.

**FREE**—Complete data covering specifications, additional applications and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.

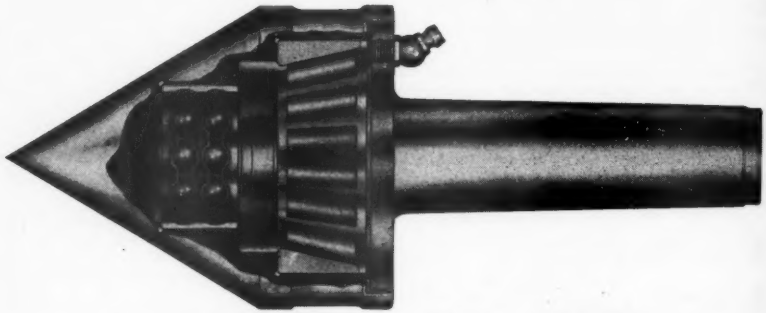
**COOLEY ELECTRIC MANUFACTURING CORP.**
32 SOUTH SHELBY STREET • INDIANAPOLIS 7, IND.

# MARVECO

## LONG LIFE

When we speak of MARVECO LONG LIFE, we mean that MARVECO is a PRECISION tool built to stand the gaff over a longer period of time than any other Live Center made.

***Have you tried your Marveco yet?***



***The MARVECO is GUARANTEED to OUTPERFORM and OUTLAST any other LIVE CENTER.***

***. . . Let us prove it! . . .***

**SEND US YOUR CENTER PROBLEMS**

**MARVEL TOOL & MACHINE COMPANY**

*Exclusive Manufacturers of MARVECO...The Live Center*

**10973 W. JEFFERSON, RIVER ROUGE 18, MICHIGAN**

# CHICAGO
## "Safety Plus" Socket Screws

## A Definitely Better Product

Into the manufacture of Chicago "SAFETY PLUS" Products goes all of the ingenuity acquired in 73 years of experience in the production of the finest threaded products.

This—*plus* the development of trained technicians—*plus* rigid raw material control—*plus* modern machines and inspection aids, adds up to only one thing—*a definitely better product* . . . You get just that when you specify Chicago "SAFETY PLUS" Socket Screws.

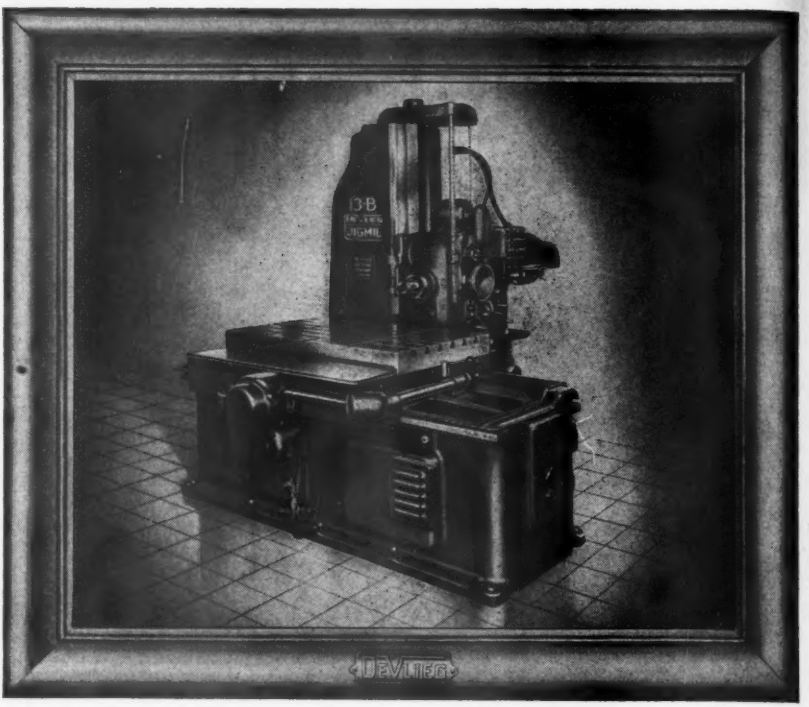
ARMY E NAVY

*These Fine Products are sold only thru Authorized Distributors*

**THE CHICAGO SCREW CO.**

ESTABLISHED 1872

1026 So. Homan Avenue Chicago 24, Ill.



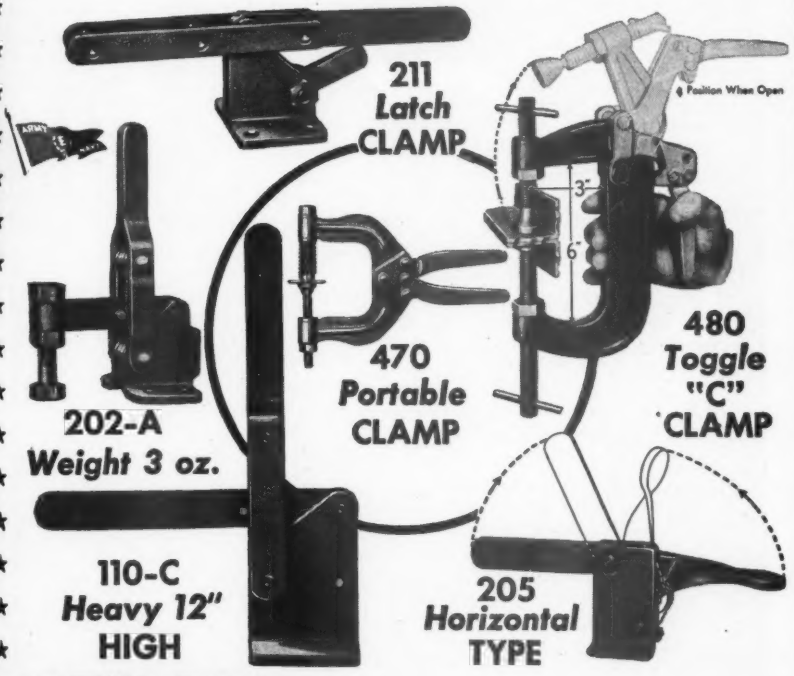

# *The World's Finest Boring and Milling Machine*

THIS new model 3-B JIGMIL has automatic power means to position the spindle from one location to another accurately to within much less than .0001 (one ten-thousandth part of an inch). Thus, extreme laboratory accuracy is conveniently available with ordinary skill that would normally make such precision very high in cost. This, and many other refinements, go further to prove that the JIGMIL idea is a totally new approach to the problems of precision boring at a new low cost.

**DeVLIEG MACHINE COMPANY** DEVLIEG JIGMIL **450 FAIR AVE.** FERNDALE 20, (Detroit) MICH.

# Building JIGS or FIXTURES?

Then you'll need some of those quick acting, positive holding, De-Sta-Co Toggle Clamps . . . Bulletin No. 43 illustrates and details many types . . . complete range of sizes, and will help you in the selection of clamps best suited to your job. Send for it.




## DETROIT STAMPING CO.

Established Over 25 Years

344 Midland Ave • Detroit 3, Mich.

# THE NEW CHAMPION

We quote from a recent letter (unsolicited) from one of the largest aircraft engine plants in the country: (name on request).

"3/8–16–4 flute bottoming tap for magnesium. This (Sossner) tap gave us a record run of 11,552 holes. I had the tap inspected before running. This finish is much higher than I find in the usual run of taps. And I believe that the success of the tap was largely due to this fact."

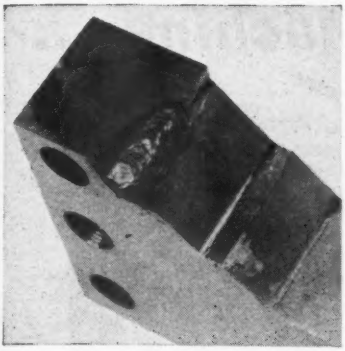
Tell us about YOUR tapping requirements and let us recommend a specific SOSSNER tap for your needs

TAPS · GAGES · STEEL STAMPS AND DIES

**SOSSNER**

161 GRAND STREET, NEW YORK 13
or 27 BROADWAY, LYNBROOK, N. Y.

# Quick, Economical Repairs to
# DAMAGED DIES
with
# PHILLIPS CRUCIBLE ARC No. 72 SPECIAL ELECTRODE



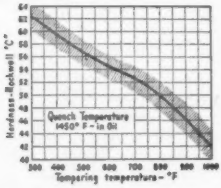
THIS repair of an oil hardening steel forming die is typical of repairs that are being made every day, saving hours and dollars with PHILLIPS CRUCIBLE ARC Tool and Die Steel Electrodes. No. 72 Special was selected for this job because it is particularly effective in cases where it is not practical to heat treat the piece after welding.

Deposits of No. 72 Special are very hard and tough in the as-welded condition, when properly applied. Hardness as deposited is approximately Rockwell C61 when cooled fairly rapidly, and the metal has high non-shrinkage characteristics. Hardness values obtainable by heat treatment are indicated by the accompanying curve.

This electrode will get your production manager out of many tough spots at a surprisingly low cost. Complete information on its use, with much valuable data on other aspects of metal arc welding on tool and die steels will be found in our handbook. Copy on request.

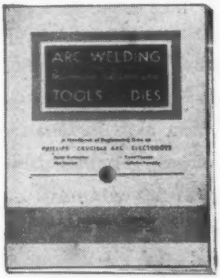
### Application Procedure for No. 72 Special

Use electrode positive. Prepare clean, bright surface for each application. When multiple layers are deposited, clean carefully between layers. Current settings will be approximately the same as for mild steel electrodes of the same diameter. To obtain high hardness as welded, avoid heating the adjacent base metal above the tempering temperature.




Tempering Curve, No. 72 Special

No. 72 Special as Deposited (250 ×)




*Send for this free manual on arc welding Tool and Die Steels*

C. E. PHILLIPS & COMPANY

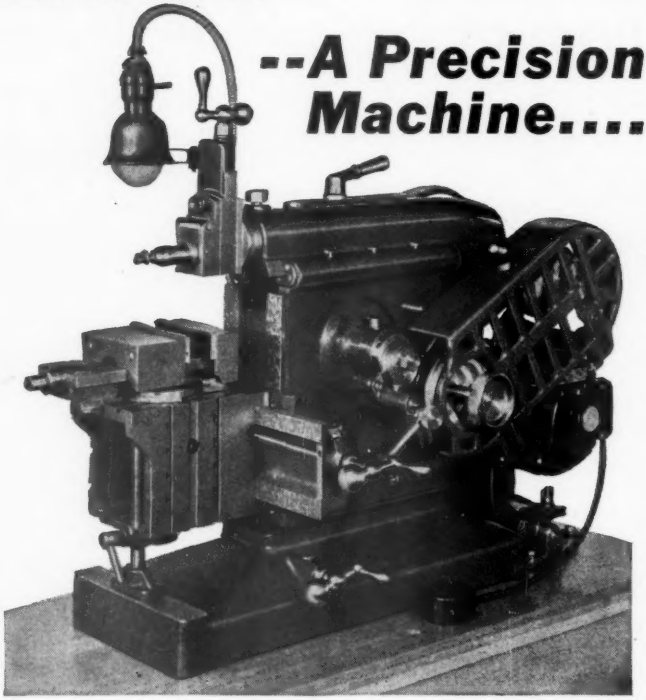
2739 Poplar Street
Detroit 8, Michigan

332 So. Jefferson St.
Chicago 6, Illinois

MANUFACTURERS AND DISTRIBUTORS OF WELDING ELECTRODES AND SPECIALTIES

# AMMCO 7″ SHAPER

## --A Precision Machine....



On jobs requiring a stroke of 7″ or less, the AMMCO 7″ SHAPER will enable you to save a lot of time and expense on a set-up such as would be required on larger shapers . . . You also have an opportunity to effect considerable savings in capital investment . . . savings in electrical power consumption . . . and savings in floor space . . . Furthermore, in addition to getting away from the larger cost of operating a big shaper on small work, the AMMCO will leave big shapers open for big jobs . . . Users tell us "it's the finest made."

Available for stationary installation, or as a portable unit.

ARMY E NAVY

***Write today for specifications and prices.***

**AMMCO** 2100 COMMONWEALTH AVENUE
NORTH CHICAGO, ILLINOIS

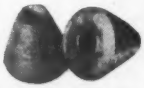
# GREATER ACCURACY—MORE PRODUCTION ON PARTS LIKE THESE with the SUNNEN PRECISION HONING MACHINE

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Roller Bearing Outer Race. Finish improved from 12 micro inches to 2 micro inches.

Inner Bearing Ring "Accurately removes last tenth' of stock."

Saved time in producing a smooth accurate finish on this bronze remote control valve body.



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

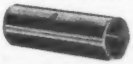
Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Cast Iron Valve Stem Guide. ½ to one thousandth removed — 220 pieces per hour. Better finish and straighter hole.

Bearing. A very small part. 2 micro-inch finish necessary.



Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

Compressor Yoke. Alignment maintained and better finish produced.

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.

The Sunnen Precision Honing Machine is now furnished with a larger base containing a coolant pump, which provides a constant flow of honing fluid to the part being honed. The fluid acts both as a coolant and a lubricant, giving better honing properties to the abrasive. You get a smoother finish, more accurate work in less time.

### *Consider These Advantages, Too*

- **Hones and finishes internal cylindrical surfaces from .185" to 2.625"**
- **Can be used in any metal or plastic except lead or babbitt**
- **Does not require skilled labor**
- **Accuracy within .0001" guaranteed**
- **No jigs or fixtures needed**
- **Economical to operate**
- **Quickly and easily set up**

Write today — for bulletin giving complete information.

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

SUNNEN

**SUNNEN PRODUCTS COMPANY, 7947 Manchester Ave., St. Louis 17, Missouri**

*Canadian Factory: Chatham, Ontario*

RIVETT

# PLAIN BENCH LATHES FOR FINE FINISHING

The well equipped lathe department finds the modern Rivett plain bench lathe indispensable for fine finishing operations. The Rivett balanced design, power and speed range have brought the bench lathe and its precision out of the tool-room into production. Many operations formerly done on heavy, costly machines are now being properly routed to bench lathes.

Selection can be made from two sizes of Rivett plain bench lathes complete with their mountings, drives and attachments. Series 918 has 9" swing, 18" center distance and 1" collet capacity. Series 715 has 7" swing, 15" center distance and ¾" collet capacity.

Write for Bulletin

Rivett Series 715

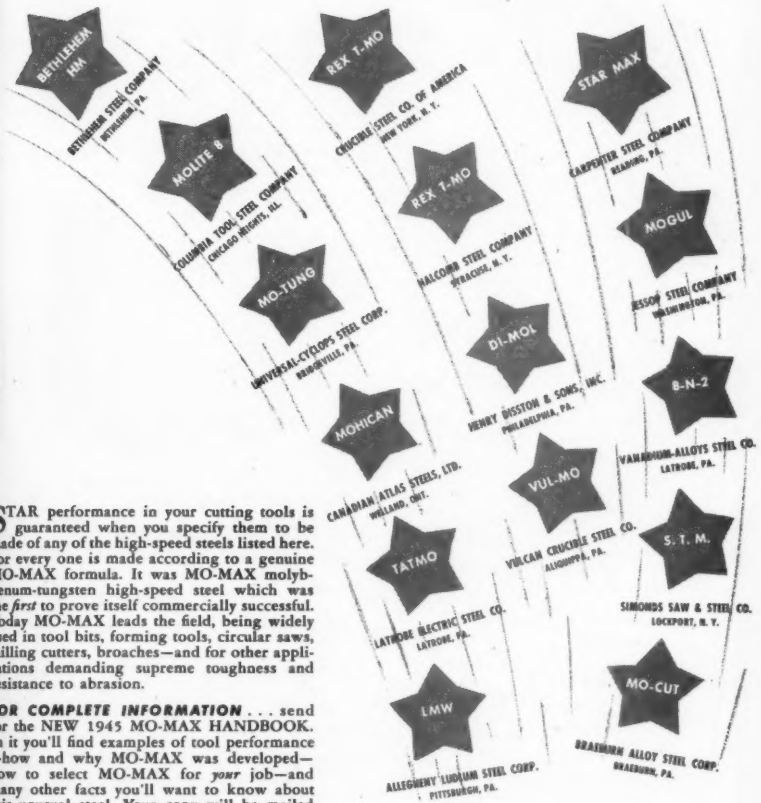
ARMY E NAVY

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS., U.S.A.

**THESE HIGH-SPEED STEELS ARE YOUR ASSURANCE OF**

# STAR PERFORMANCE




STAR performance in your cutting tools is guaranteed when you specify them to be made of any of the high-speed steels listed here. For every one is made according to a genuine MO-MAX formula. It was MO-MAX molybdenum-tungsten high-speed steel which was the *first* to prove itself commercially successful. Today MO-MAX leads the field, being widely used in tool bits, forming tools, circular saws, milling cutters, broaches—and for other applications demanding supreme toughness and resistance to abrasion.

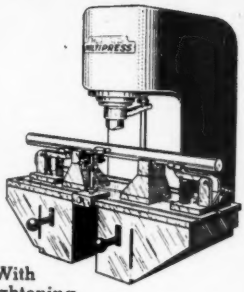
***FOR COMPLETE INFORMATION*** . . . send for the NEW 1945 MO-MAX HANDBOOK. In it you'll find examples of tool performance—how and why MO-MAX was developed—how to select MO-MAX for *your* job—and many other facts you'll want to know about this unusual steel. Your copy will be mailed upon receipt of your name and company connection. Write today to Dept. A.

**THE CLEVELAND TWIST DRILL CO.**
1260 East 49th St. Dept. A Cleveland 14, Ohio

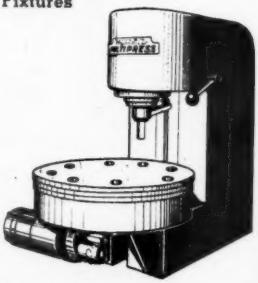
***THEY'RE ALL*** **MO-MAX**

# MULTIPRESS

## AN ENTIRELY NEW KIND OF INDUSTRIAL TOOL



With Straightening Fixtures



With Motor Driven Indexing Table

## For Scores of Production Jobs

MULTIPRESS is a completely self-contained bench-size machine tool offering up to 4-tons pressure for an amazing range of operations. Downward ram pressures from 300 to 8000 pounds . . . upward pressures to 5000 pounds . . . stroke adjustable from 6 inches to 1/16 inch . . . ram speeds downward up to 200 inches per minute. Work table, 10½ x 16 inches without extensions. 11 inches between ram and table! Scores of standard fixtures extend its use to almost any type of work calling for pressure—sustained, in repeat strokes, synchronized with indexing tables, in automatic cycles, and many other ways. Write for details!

**Basic Unit $575.00**

The DENISON Engineering Co., 1197 Dublin Rd., Columbus 16, Ohio

DENISON EQUIPMENT for APPLIED HydrOILics

## FOR ACCURACY TO .0001"...

# SpeediChuk
WITH THE Precision **BREN COLLET**

**Increases 1/2" Collet Capacity Lathes to 3/4"**

- **Fits ATLAS, LOGAN, SOUTH BEND, CLAUSING Lathes and others with a 1½" x 8 Thread Spindle Nose having a No. 3 Morse Taper on inside**

Accuracy to .0001" is possible with SPEEDICHUK because of its unique floating closing ring and the BREN Collet, whose body taper conforms with the taper of the lathe spindle.

Centering to desired accuracy may be attained by tapping work, and indicating. SPEEDICHUK is ideal for tool room use or short production runs where speed in opening and closing on work is not essential. It requires no adapter plate and is easily fitted to the lathe.

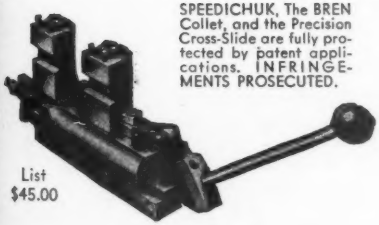
List Price
SPEEDICHUK
$19.75
BREN Collets
Round $4.50
Sq. & Hex. $7.50

**IMMEDIATE DELIVERY FROM STOCK**

## ..AND FOR PRODUCTION CUT-OFF WORK, FORMING, ETC.

THE NEW Precision LEVER TYPE **CROSS-SLIDE**

- **Equipped with sensational tool leveling adjustment — Maintains tool in absolutely horizontal position.**



SPEEDICHUK, The BREN Collet, and the Precision Cross-Slide are fully protected by patent applications. INFRINGEMENTS PROSECUTED.

List
$45.00

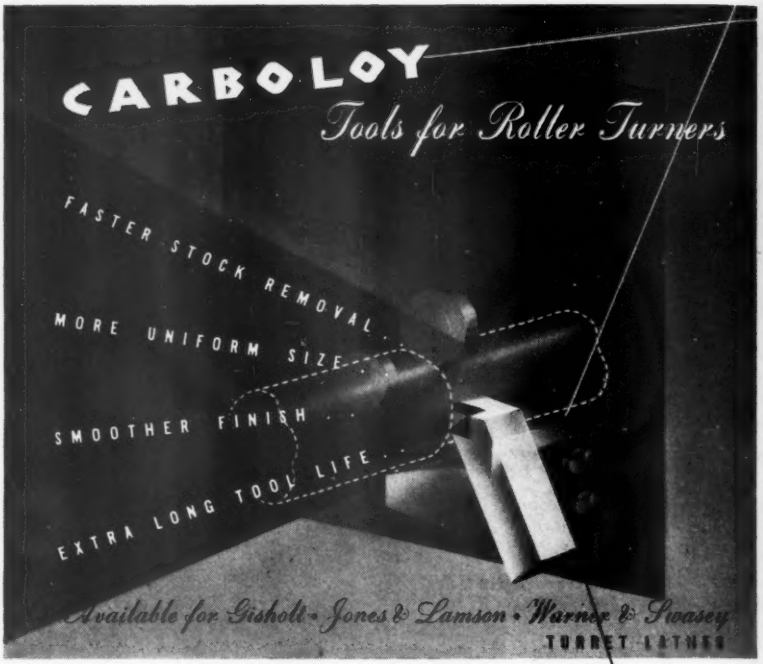
A sturdily constructed job, this Cross-Slide has no rack and pinion to become clogged with chips. Handle adjustable in three positions for convenience of operator. Has a five inch travel.

Three models fitting Atlas, Logan, 9" South Bend; can be adapted to most other bench lathes.

- Order from your dealer or write us for literature.

GENERAL DIE-STAMPING-TOOL COMPANY
Precision Collet Division, 262-272 Mott St., New York 12, N. Y.

Precision product


CARBOLOY
Tools for Roller Turners
FASTER STOCK REMOVAL . . .
MORE UNIFORM SIZE . . .
SMOOTHER FINISH . . .
EXTRA LONG TOOL LIFE . . .
Available for Gisholt • Jones & Lamson • Warner & Swasey
TURRET LATHES

When machining bar stock with roller turners, you'll step up output and step down costs with Carboloy Roller Turner Tools.

Designed for extra long tool life and rapid regrinding, Carboloy Roller Turner Tools remove stock faster, hold more uniform size, and produce a better finish.

Carried in stock ready for prompt deliveries. Standard styles for Gisholt, Jones & Lamson, and Warner & Swasey Turret Lathes. For top production, and maximum economy, put Carboloy Roller Turner Tools on your jobs. Write for catalog 11109.

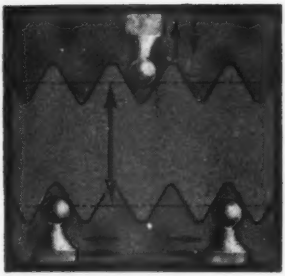
STANDARD CARBOLOY TRADE MARK TOOLS

CARBOLOY COMPANY INC. • 11109 E. 8 MILE BLVD. • DETROIT 32, MICHIGAN

Chicago • Cleveland • Houston • Los Angeles • Milwaukee • Newark • Philadelphia • Pittsburgh • Thomaston, Conn.

Positively, More Accurately and to closer tolerances

MODEL 45B-100. The upper, sensitive roller contact actuates the Dial Indicator.



MODEL 45B-80. The upper, sensitive ball contact actuates the Dial Indicator. Both lower ball anvils float sidewise independently to compensate for any variation in lead.

No conventional type of gage, whether ring gage or roller-type snap gage, can tell you so **definitely** and so **quickly** the degree of accuracy of a pitch diameter as these two types of Dial Indicator Gages. Neither depend upon the uncertain sense of touch.

The roller type tells more than the conventional roller snap gage because the sensitive upper roller contact, reveals on the Indicator, just **how much** and **where** the pitch diameter may be wrong. The ball type simulates the three-wire method, but is faster. It is accurate to a tenth of a thousandth. Either type is incorporated in the adjustable Dial Indicator Gage shown below. For details write—

TWO FULL COLOR FILMS
(With Sound)
No. 1 DIAL INDICATORS
No. 2 DIAL INDICATOR GAGES
20 minutes each. For instruction and training. For showing write

FEDERAL PRODUCTS CORPORATION
PROVIDENCE 1, RHODE ISLAND

CHICAGO • CLEVELAND • DETROIT • DALLAS • HARTFORD • HOUSTON • INDIANAPOLIS • LOS ANGELES MEMPHIS • MILWAUKEE • MINNEAPOLIS • MONTREAL NEW YORK • PHILADELPHIA • PITTSBURGH ROCHESTER • SAN FRANCISCO • ST. LOUIS • TORONTO WINDSOR

FEDERAL

PRECISION MEASURING INSTRUMENTS

Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action . . .
that compensates for expansion due to heat, shock and excessive thrust loads—reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requires a specialist's experience . . . standard shanks with Morse taper carried in stock.

**Send us your specifications and blueprints—We will see that your job is set up with the right LIVE CENTER—prompt deliveries on high priorities.**

# STURDIMATIC
## TOOL COMPANY
5226 THIRD AVE. DETROIT 2, MICH.

**ROTARY FILES** solve many a production-line problem of cleaning or smoothing out hard-to-get-at corners or surfaces. Dove-tail surfaces (as above), for instance. Here a Nicholson Inverted Cone Shape Rotary File with *Ground* teeth makes the operation simple and speedy.

**16 NICHOLSON STANDARD ROTARY FILE SHAPES**
***in both Hand Cut and Ground types***

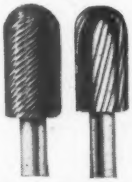
| | | |
|---|---|---|
| Cylindrical Flat End | Ball | Inverted Cone |
| Cylindrical Radius End | Oval | Cone 60° Included Angle |
| Tree Shape Radius End | Cone | Cone 90° Included Angle |
| Tree Shape Pointed End | Flame | Concave Type I |
| Cylindrical Double Taper | Barrel | Concave Type II |
| | | Bi-shape *(Concave-Convex)* |

**Cuts — COARSE, MEDIUM, FINE.** ***Diameters — 1/8" to 2"***

**NICHOLSON FILE CO., 95 ACORN ST., PROVIDENCE 1, R. I.**
*(In Canada, Port Hope, Ont.)*

**Write for catalog and price list**

and for any desired special information. For deliveries, consult your mill-supply house.




**NICHOLSON ROTARY FILES**
HAND CUT AND GROUND • FOR EVERY PURPOSE
NICHOLSON U.S.A.

# Keep your "mikes" accurate!

*Here's how you use the Scherr Micrometer Parallels. Stripes or bands of different colors appear where anvil and spindle surfaces touch the glass. Those bands tell the truth about flatness and parallelism, fully described in 8-page catalog.*

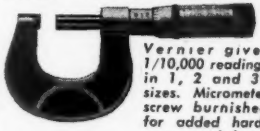
## CHECK THEM CONSTANTLY WITH SCHERR MICROMETER PARALLELS

When spindle end or anvil surface of a micrometer wear out of parallelism, the mike's accuracy is affected – a condition which ordinarily becomes apparent only after trouble has resulted. An occasional check with Scherr Micrometer Parallels will avoid this, and tell you when the micrometer measuring surfaces begin to need refinishing.

The two optical flats differ in thickness approximately one half turn of the micrometer spindle. Their use is simple. Close the spindle on one of the optical flats and observe the light rays at points of contact. Then measure the other optical flat in the same way. If the interference bands appear the same, no correction is needed. If they differ in appearance, parallelism has been lost.

This is the way the makers check new micrometers. Why not use their approved method? SET OF TWO OPTICAL FLATS, AS SHOWN – $25.00.

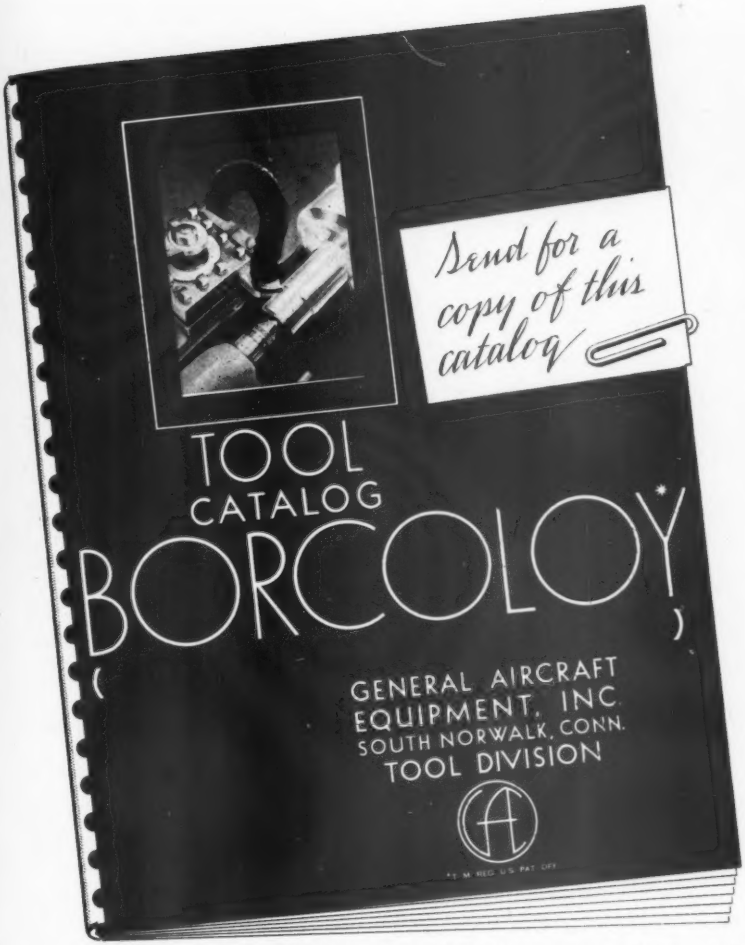
## REED MICROMETERS



*Vernier gives 1/10,000 readings in 1, 2 and 3" sizes. Micrometer screw burnished for added hardness and long wear. Insures close, sensitive measuring. 1" TOOL AS SHOWN, $5.73, POSTAGE PREPAID. IMMEDIATE DELIVERY – ORDER NOW.*

*10-day money back offer on all Scherr tools. Write for details on our full line.*

**GEO. SCHERR CO., Inc.** 200-B LAFAYETTE STREET NEW YORK 12, N. Y.




• LEARN ABOUT THIS NEW SUPER HIGH SPEED STEEL WITH ALL THE DISTINCTIVE FEATURES OF CENTRIFUGALLY CAST ALLOYS, WITH HIGH WEAR RESISTANCE DUE TO THE PRESENCE OF BORON AND WITH MAXIMUM RED HARDNESS IMPARTED BY TWENTY PER CENT COBALT •

**GENERAL AIRCRAFT EQUIPMENT, INC.**

**SOUTH NORWALK, CONNECTICUT • TOOL DIVISION**

# Selection

## in industrial diamonds ... time is the teacher

Only by long experience in the selection and application of diamonds for use in a wide variety of industries, is it possible to develop the knowledge and "feel" of stones capable of performing maximum service at minimum cost. J. K. Smit, for more than a half century, has been building a reputation which now makes them the Tiffany of the industrial diamond field. The purchase of diamonds selected by J. K. Smit assures the user of getting the greatest service from:

- an OCTAHEDRAL diamond in a Sta-kool or other single-point tool for truing and dressing grinding wheels.
- an OVAL stone selected for the curved nib of a Ready-set tool for the same purpose.
- a SINGLE African or Brazilian bortz diamond selected for a shaped boring tool.
- MANY SMALL diamonds for use in core bits, selected for their sharp rock-cutting edges.
- WHOLE diamonds, reduced by special process to diamond powder of even grit for use as powder and as the abrasive agent of diamond wheels for sharpening the now popular carbide tools.

ARMY E NAVY

J. K. SMIT & SONS

157 Chambers St. New York, N.Y. 6400 Irvington, Calif.

Possession of large stores of diamonds insures perfect selection and prevents price fluctuation. The J. K. Smit Technical Advisory Staff will gladly assist your Production Department in the solution of its diamond tool problems.

DIAMOND WHEELS • TOOLS FOR DRESSING WHEELS • CORE BITS • METAL WORKING TOOLS • POWDER

**UNBELIEVABLE PERFORMANCE ON CARBIDE-TIPPED TOOLS!**

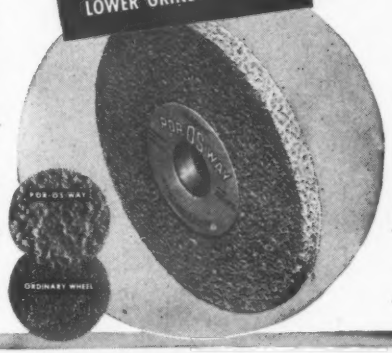
Green silicon carbide is back from the war in Por-os-way wheels for carbide-tipped tool grinding. Put it to work! You'll actually be amazed at its performance—bringing you 2 to 5 times faster, cheaper grinding without burning or discoloring!

**2 TO 5 TIMES**
**LOWER GRINDING COSTS**

YOU'VE got a happy, satisfied crowd of machinists when you let them go to town with Por-os-way—the open structure grinding wheel that cuts deeper, faster, *cooler*. Machinists *go* for it! They like it—the way it bites through toughest metals like lightning, the way it cuts down rejects, the way it stays clean and lasts longer. And, brother, in the days ahead *when costs must be cut to the bone*—you'll go for Por-os-way, too! Call in a Por-os-way engineer and make us *prove*, "No wheel has yet bettered a Por-os-way!" A. P. de Sanno & Son, Inc., 464 Wheatland Street, Phoenixville, Pa., Since 1893.

**LOOK AT THE DIFFERENCE**

Your eye tells you at a glance why Por-os-way is *different*. See the *extra porosity* that gives you over 8 distinct operating advantages!




RADIAC*

**POR-OS-WAY***

*The Precision Grinding Wheel*

**NO GROAN, NO MOAN, NO GRUNT IN POR-OS-WAY SURFACE GRINDING!**

Try Por-os-way segments for surface grinding. Notice the greatly increased speed, notice how quietly the cutting edges of Por-os-way dig deep into the metal. Por-os-way cuts, doesn't "scrape" the surface! Time out for dressing is greatly reduced, too!

*T. M. Reg. U. S. Pat. Off. Copyright, 1945, A. P. de Sanno & Son, Inc.

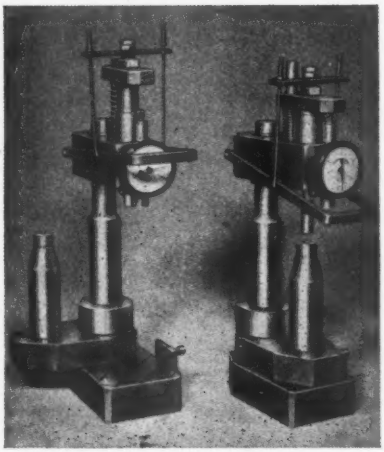
THE WHEEL THAT COSTS THE MOST AT FIRST . . . COSTS THE LEAST AT LAST

# SUN DIAL INDICATOR GAUGES

**for . . .**
**DEPTH, LENGTH,**
**THICKNESS,**
**HEIGHT,**
**LOCATION,**
**and *Special***
***Measurements***

DEPTH GAGE

## HIGH-SPEED • • ACCURATE • FOOL-PROOF • • DURABLE •



THICKNESS GAGE

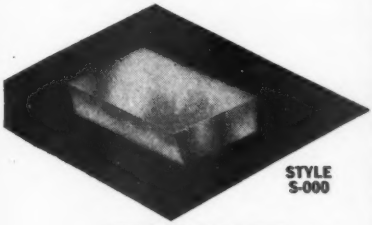
**This high-speed, durable, and accurate gage enables you to take readings of variations as small as .0001". Each individual depth and length dimension can be checked visually, and errors determined. No expensive or complicated measuring equipment is required either for checking or setting. A simple master setting gage supplied with each SUN DIAL INDICATOR GAGE provides a quick and dependable method of setting and checking.**

**These instruments are being used in inspection rooms and on production lines by ordnance manufacturers working for the U. S. Army, Navy and Air Force.**

***Descriptive folder will be sent you on request—no obligation.***

**SUN TOOL AND GAUGE CORPORATION**
**380 Canal Street · New York City**

# *New* KENNAMETAL *"Universal"* BLANKS



STYLE S-000

## FACILITATE TOOL MAKING

### *and Keep Stocks Down!*

These new Kennametal "Universal" tool blanks are literally "jacks-of-all-trades." Rectangular in shape, with 12° clearance angle formed on one long edge, they can be used to make many different types of tools, simply by setting them into open-end recesses, as illustrated. They are available in all recognized standard sizes, many of which are stocked in several grades.

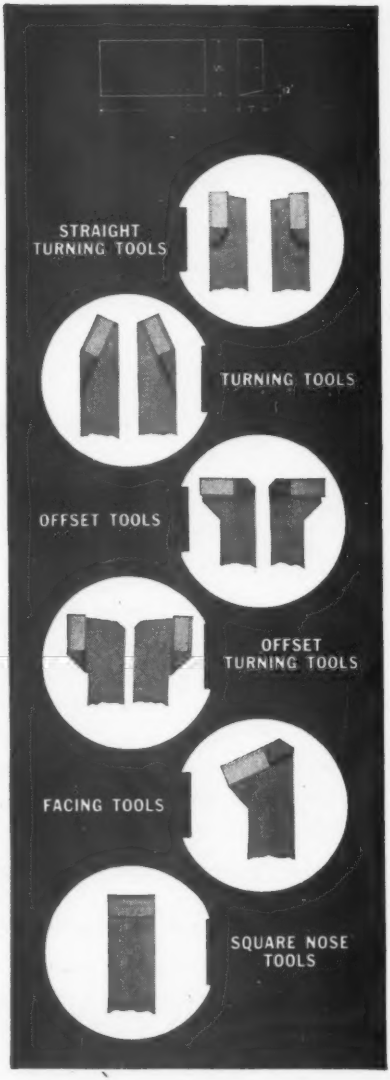
Their use reduces inventory investment, and simplifies stock room problems. And, above all, they make it easier for you to employ on a widespread, yet economical scale, the advantages of Kennametal—its ability to cut metal, including steel up to 550 Brinell hardness, accurately, at greatly increased speed, with amazing tool life.

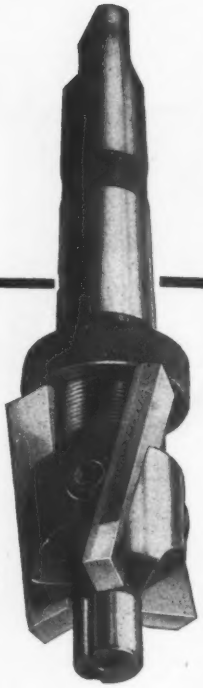
*Catalog particulars, and prices, are yours for the asking.*

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.





*This is the only standard inserted blade type* **FACING AND COUNTERBORING TOOL**

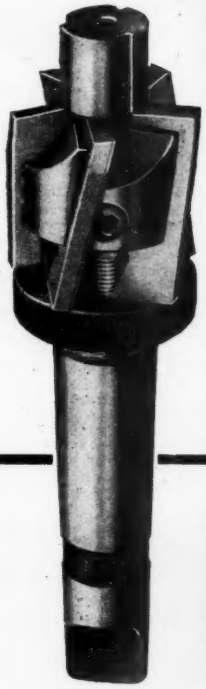
GENESEE

**Replaceable Blades — Interchangeable Pilots — Constant Chip Space**

**STANDARD SIZES FROM 1¼ TO 4 IN. IN DIAMETER**

**STYLE H** tools are designed for heavy cuts where maximum stock removal is required.

**STYLE F** tools are recommended for light finishing cuts where a very smooth and accurate finish is required.



Genesee Tools have blades set on a back slope to permit adjustment for size and regrinding diameter and front edge.

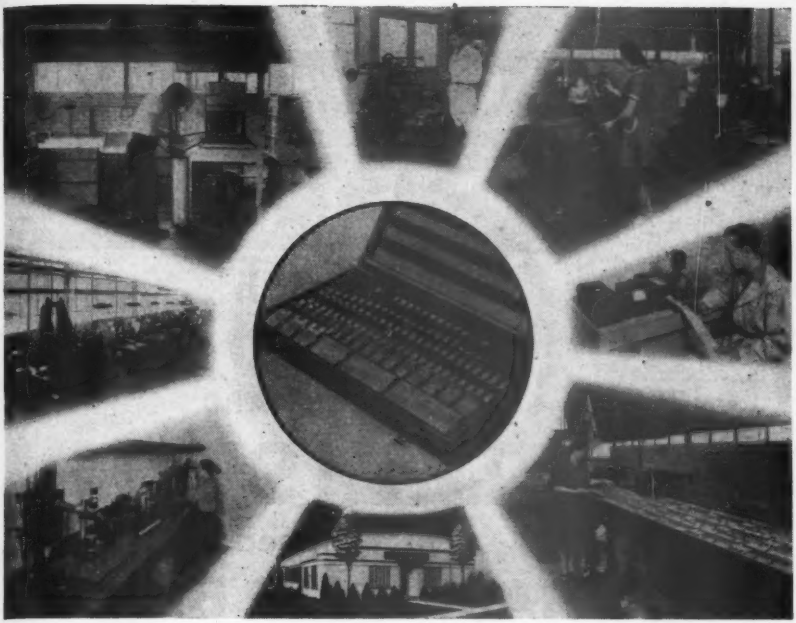
**WRITE FOR COMPLETE CATALOG 44-T**

**ESTABLISHED IN 1906**

**GENESEE MANUFACTURING CO., INC.**

**ROCHESTER 4, N. Y., U. S. A.**

**Adjustable Hollow Mills and Special Production Tools**



# The Science of Precision Gage Making
# WEBBER GAGE COMPANY

**Over a long period of years the growth of the Webber Gage Company has been constant. Today in a plant designed, built and equipped for the rapid production of precision gage blocks Webber has become the largest exclusive manufacturer of gage blocks.**

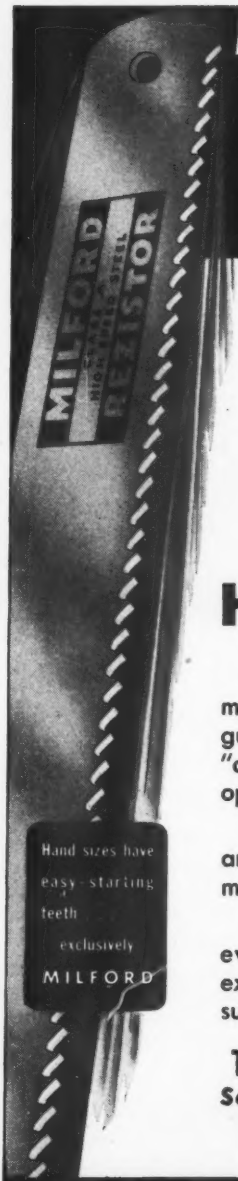
**Illustrated are a few random shots of operations and modern equipment used in the manufacture of Webber Gage Blocks and some of the instruments used for testing them while in process.**

**Here you get a glimpse of the painstaking care taken at various steps in the manufacture of the gage blocks from heat treating to shipment.**

**It has always been the Webber policy to maintain the most up-to-the-minute equipment for production and the most modern instruments for testing.**

**Now manufactured in this air conditioned plant—tested in temperature controlled rooms—Webber offers the ultimate in precision gage blocks.**

***Make your next set of blocks—Webber Gages.***




# STRAIGHT CUTTING

with

## MILFORD

ALL-HARD

# REZISTOR

High Speed Steel

## HACK SAW BLADES

Close, accurate control of every step in their making . . . *plus* rigid, individual inspection . . . guarantees flat, straight blades, free from "bow" or "dish". Straight cutting eliminates costly machining operations, saving time and money.

Add to this the fact that MILFORD blades cut fast and long and you have the last word in the saw maker's art.

Yes, MILFORD blades are real cutting tools . . . every one of them backed by the accumulated experience and know-how of over sixty-five years of successful saw manufacturing.

**THE HENRY G. THOMPSON & SON COMPANY**

***Saw Specialists Exclusively for Over 65 Years***

**NEW HAVEN 5, CONNECTICUT, U. S. A.**

Also manufacturers of MILFORD Profile Saw . . . first choice in narrow blades for all contour and profile band saw machines.

# Guide

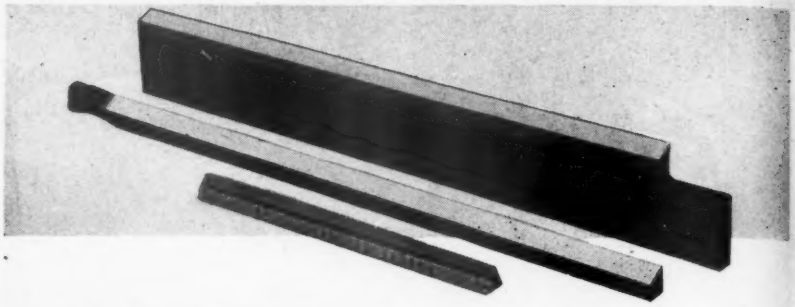
YOU will find frequent occasions to use this PM Gage and Small Tool Catalog—with its complete information about PM Diamond Emblem Gages—for accurate and precise production control.

Also described are many types of small cutting tools—built to form metal in accord with today's accurate dimensional standards and close tolerances.

The PM Diamond Emblem on all of these gages and tools is your guarantee of initial accuracy and extra care used in finishing and hardening.

If you have not already received your copy of the new catalog, a request on your company letterhead will bring one to you.

The PIPE MACHINERY COMPANY Cleveland, O.

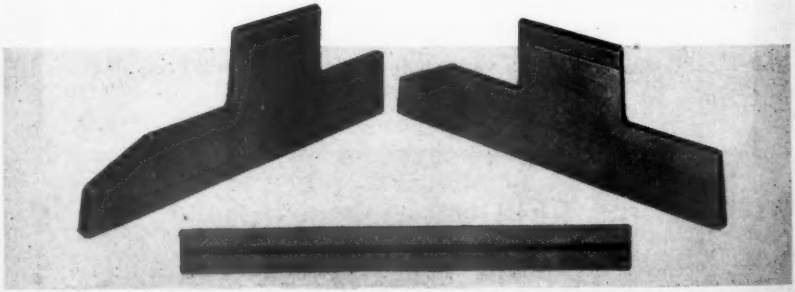


# CENTERLESS GRINDER BLADES TIPPED *with* COLMONOY No. 6

● We can furnish tips separately, or provide complete tipping service, consisting of casting tips of Colmonoy No. 6 and applying them to a mild steel base with Silver Solder or low temperature brazing alloy. Special holding fixtures prevent warpage of blade. Write for Bulletin CG-7 for prices and complete information.

## WALL-COLMONOY CORP.

**720 Fisher Bldg., Detroit 2, Mich.**



Save production time with a

# SHOPLIFTER

## One man can handle heavy dies alone.

## Not necessary to stop other machines to get help.

More production per day from your machines if a Shoplifter is handy to do the heavy job of moving dies from storage racks to the press. In these times when maximum production of machines is of vital importance, much time and labor can be saved if the operator can handle the heavy work of changing dies without calling for help from other operators.

The Shoplifter is built for this job. Dependable and safe with a rated capacity of 500 lbs. (heavier machines up to 5000 lbs. can be furnished). Entire machine built of structural steel. Electrically welded throughout. Steel platform 24" x 24", lifts 54" above floor and lowers to within 4⅞" of floor. Overall height 72". Crank, up and down, hoist unit.

***Prompt Delivery . . . Price $147.50. Full freight allowed***

**ECONOMY ENGINEERING CO., 2659 W. Van Buren St., Chicago 12, Illinois**

# Bunell

## WIDE RANGE OF FACILITIES

OUR facilities are particularly valuable to manufacturers because they include such a very wide range of sizes and types. Machine tools and accessories for producing tools, dies, jigs, fixtures and gages range from very small to generously large —limits of 15 to 20 tons. Precision parts facilities are similar.

Our "know-how" includes design, development and construction of tooling as well as complete production of parts and assemblies.

From time to time we have openings for early deliveries of both tools and parts. Your inquiries will be given courteous consideration.

**Chamber of Commerce award as the best small industrial plant completed in 1941-42.**

## THE BUNELL MACHINE & TOOL COMPANY

1601 EAST 23RD STREET • TELEPHONE CHERRY 0343 • CLEVELAND 14, OHIO

# HAS WHAT IT TAKES TO DO YOUR JOB RIGHT

## . . . at the right price

★

This large planer is one of many equally modern machine tools in our plant, both large and small . . . . . They are manned by genuinely skilled operators.

★

DESIGNERS AND MANUFACTURERS OF

Tools • Special Machinery • Dies • Jigs • Gauges • Fixtures

PRECISION PRODUCTION OF PARTS AND ASSEMBLIES

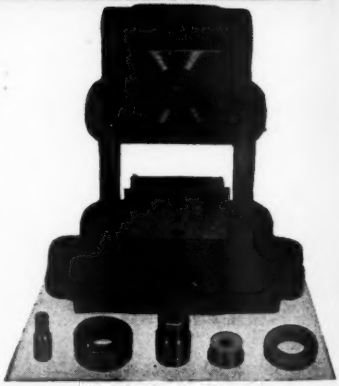
*When you purchase*

# HOVIS *UNIVERSAL MASTER WASHER DIES*

**Each Hovis Universal Master Washer Die is made on an all-steel precision standard die set which comes complete with stock gauges and stops. The Master Dies themselves do not become obsolete. They can be used for both present and post-war production.**

**Once having made your investment in Master Dies, 5 SMALL INTERCHANGEABLE PARTS are all you need to buy to make any size washer for your new product.**

***Ask today for illustrated, descriptive literature***



**Made in 5 sizes:**
**¾"—1½"—2½"—4"—6".**

## HOVIS SCREWLOCK COMPANY

**8100 E. NINE MILE ROAD**
**Suburb of Detroit**

**VAN DYKE, MICHIGAN**
**Phone: Centerline 1575**

# *New Micrometer Accuracy*

## WITH SAV-WAY MASTER SETTING AND CHECKING ROLLS

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**Every production man knows that precision tools and inspection devices are only as accurate as the methods and gages by which they are checked and set. When anvils are worn unevenly, flat gage blocks may not be adequate. This Sav-Way set of Master Setting and Checking Rolls provides for the first time a really accurate means of checking micrometers, and other types of gages under all conditions of wear. The set consists of 20 rolls, ranging from .100" to 2.000" diameter. Rolls are hardened, ground, and lapped to X gage tolerance. The set is housed in a modern, transparent, plastic case.**

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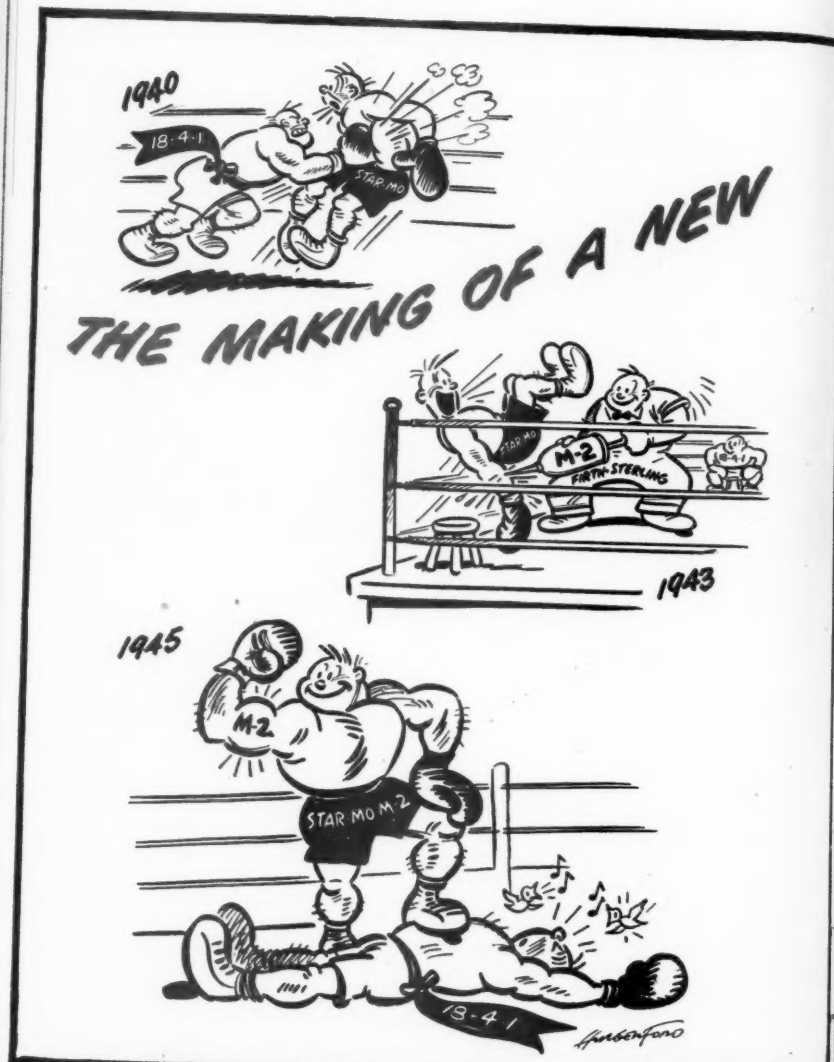
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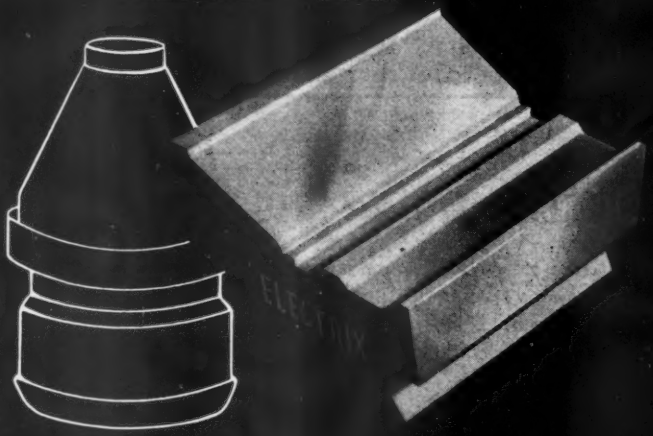

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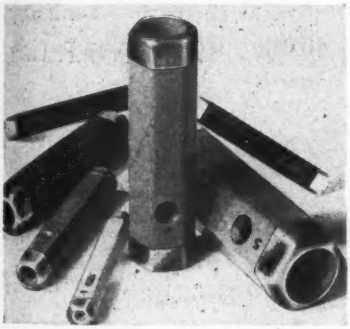

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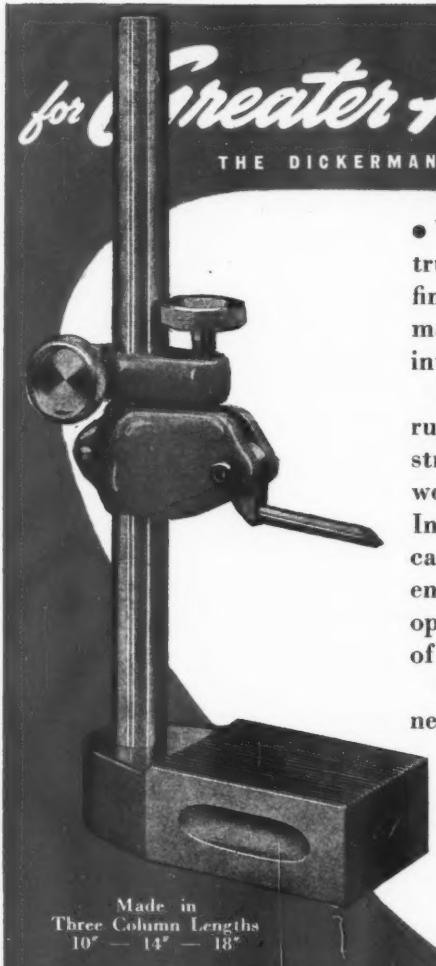

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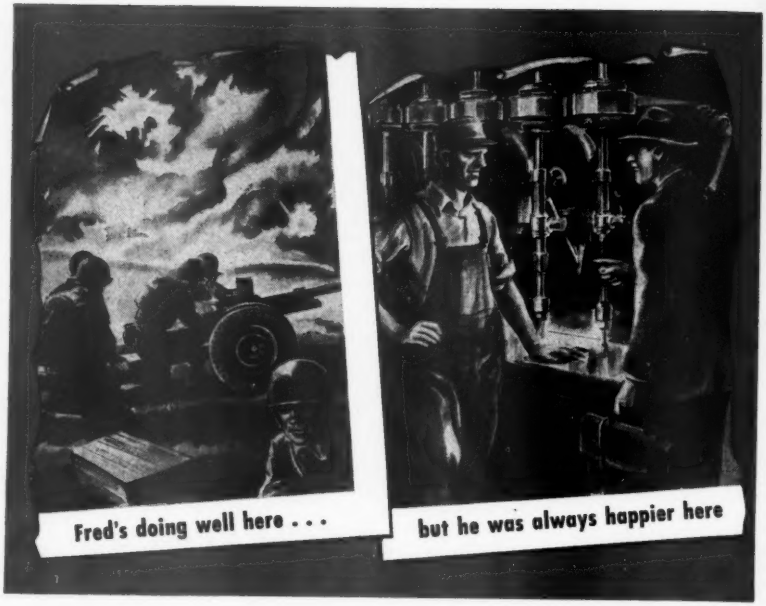


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# AMERICAN INDUSTRY'S WORLD INTEREST

THE men who direct and the men who work in the industrial plants of America know from experience what it would mean to the war-weary people of Europe and Asia if they could be returned quickly to their peace-time pursuits. No other feeling of depression is exactly like that which derives from being out of a job or even of having no genuinely useful thing to do. But give a man the inspiration of knowing that he has a place in the economy of thought and action, and accomplishment will soon flow from his efforts.

When the war is over whole nations will have the problem of re-employment and for an entire nation to be confronted by such a prospect must be hopeless indeed. There is an old saying that the devil finds mischief for idle hands to do. Add the ingredient of idle thinking and you have fertile soil for the seeds of malicious "isms" and philosophies. The logical thing to do is to provide work for idle hands—genuinely constructive, income-producing work.

Last month's editorial asserted that American Industry has a vital, permanent interest in foreign politics, or perhaps we should have said in foreign affairs. Specifically, we mean economic conditions within all of the world's nations. In our role as the principal supplier of manufactured products needed for the successful prosecution of this world war we have built up capacity beyond our immediate post-war needs. Our worker total is at an all-time high and with the war's end we must add large numbers of veterans which build up to an over-all total of between fifty and sixty million men and women. Nevertheless, during the transition and afterwards when peace is with us again one of American Industry's important contributions to world rehabilitation will be through full employment of its own workers and thus large production of manufactured items for ourselves and for other nations.

Very recently an American War Production Board committee toured France and Belgium to investigate and report upon the condition of their manufacturing facilities. Some plants and equipment were found to be in a better state than earlier reports had indicated. Many machines and tools had not been removed, nor were they wrecked beyond repair and early use. They found a few plants already turning out tires and others converted into service and repair depots for tanks and trucks and aircraft engines.

The War Production Board commission suggested that other European plants could be sufficiently rehabilitated for early manufacture of critical military items also. There are idle machines and idle hands, but quantities of necessary materials would have to be provided by us and Britain.

This brings up abruptly the great post-war need for raw materials which will prevail in many countries. We have them, but our supply is not inexhaustible and we should have the right to make certain that such materials will be used in the interest of world-wide industrial freedom. In some European countries there has been severe destruction of tools and equipment. These will have to be replaced if industrial activity is to be resumed. We will have a surplus of some kinds and it is likely that among them will be machine tools and accessories which will not be wholly efficient for our high standards of tooling and production. Foreign wages will probably be lower than ours, in which case the use of such equipment abroad would be justified.

One correspondent*, reporting the commission's tour, suggested a form of continental WPB of which French, British and American production chiefs would be members. Careful co-operative planning to initiate and develop productive activities would relieve critical manpower problems for both Britain and ourselves. We would probably have to provide the necessary capital but at this stage of our international banking activities the additional cost, comparatively, would not be large.

Our right to co-operative international planning and action is predicated upon our participation in every phase of the world conflict. Granted that we were attacked by Japan and had to defend ourselves and that Britain's fall would have exposed us to the Nazi menace, it is still a fact that we have contributed our men, our efforts and our savings to the common cause of ridding the world of Nazism and Japanese fanaticism.

If our American system of free enterprise had failed to bring forth the "miracle of production" there would even now be a different story to tell. We know that free or private enterprise has served us well. It has provided us, as a people, with the world's highest standards of living. We believe that it can do the same for other nations and many of us, who comprise American Industry, believe that steps should be taken to insure such industrial freedom in other countries. It will be said that we expect to profit therefrom. We probably shall, but by so-doing we shall be extending to those nations what we know to be permanent benefits.

This matter of American Industry's interest in foreign economic conditions is one which has many ramifications, more than we can discuss here. But to us it seems indisputable that, in the words of the Atlantic Charter, we would be building "in co-operation with other peace-loving nations a world order under law, dedicated to peace, security, freedom and general well-being of all mankind", and by assisting other nations to achieve profitable production activity we would be contributing a great deal to the "assurance that all the men in all the lands may live out their lives in freedom from fear and want".

*William H. Stringer, C. S. M. Staff.

Geo. J. Hurbner

*Editor*

# THE USE OF CARBIDES

## FOR PRESS WORK

Interrupted by the war's outbreak and the resultant suspension of most commercial manufacturing, an important production development of great promise for postwar use in the application of carbides to processing sheet metal and to other stamping and press operations.

Peculiarly enough, though the war interrupted this development commercially, lessons since learned in producing armament components have greatly advanced the art of using carbides for press work.

An outstanding illustration has been that of forming cartridge and shell cases as well as the shells proper. Thus carbide dies made possible a switch from brass to steel shell cases—a development which would have been impossible on a high production basis without carbide dies.

The prime reason for the growing interest in using carbides for press work is this material's tremendously high abrasion resistance and consequent ability to hold close limits and maintain high finish over long runs. Although

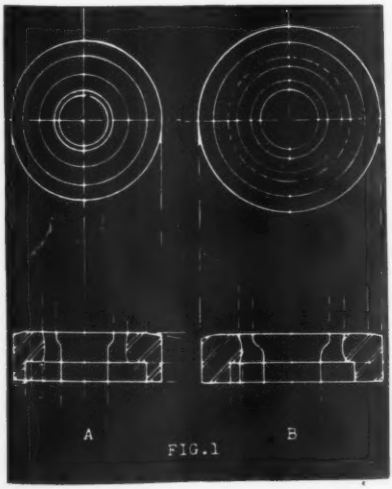
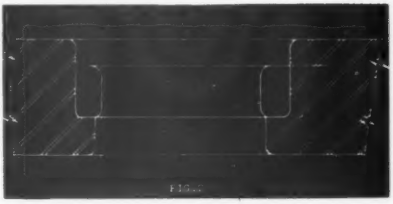


FIG.1



true that carbides cannot be used everywhere and cannot always be used interchangeably with tool steel dies, the almost universal experience has been that die life has multiplied many times whenever carbides have been carefully applied to press operations. This applies equally to forming both ferrous and non-ferrous metals, as well as to non-metallic materials including ceramics, medical compounds and even organic materials.

A cursory survey of some little-known applications of carbide dies to press work already in effect prior to the war indicates both further war time and postwar possibilities in this field. While early uses of carbide inserts for press dies, punches, etc., can be found ten years ago, real development by industry did not get under way until shortly before the war.

To illustrate design and application practice followed by industry in adapting carbides to press work, a number of commercial applications have been selected. The performance in each individual case has been investigated and the information is presented herewith.

Fig. 1—Drawing dies for manufacturing lipstick tubes. Material is 0.016 brass; tube is formed in two operations in dies shown. Total amount of reduction is from 1 in. to ⅝ in. diameter; production required around 10,000,000 such tubes. Dial presses are used, and die life is estimated as being approximately 50 times greater than when tool steel dies were used.

Fig. 2—A die for one of eight draws

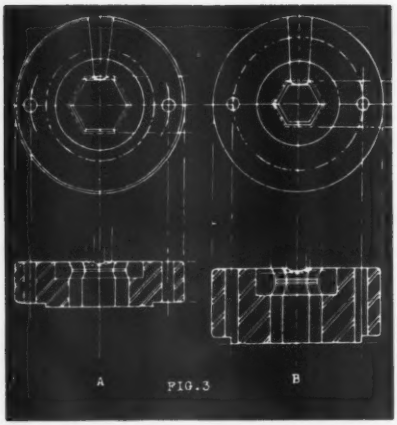


FIG. 3

on automotive engine cylinder sleeves. Special automatic presses were used. With steel dies, an average of 2000 pieces was obtained between reconditionings. With carbide dies, 200,000 pieces were obtained.

Fig. 3—Dies used to burnish the flats and hold sharp corners of nuts which have been punched and sheared. Die holders had been designed for steel dies, so carbide dies were made interchangeable. Carbide dies have processed 100 times the number of pieces as former steel dies.

One manufacturer used punches and dies made of Carboloy cemented carbide for punching out slots in laminations for small motors. Recent die inspection showed an average burr height of only 0.006 inch after punching out 7,000,000 slots in silicon steel sheet without grinding the dies. On this type of work, high speed steel dies will handle only about 100,000 slots per grind. Thus increased life of about 70 times was obtained.

Dies used for forming and compressing medicinal tablets involving a relatively abrasive material, are shown in Fig. 4. Here, carbide dies showed an even greater increase in life over high speed steel varieties. About 40 different sizes of such tablet dies are being used by manufacturers. The dies are used in combination with high speed steel punches.

Another company used round Carboloy cemented carbide die nibs with steel punches for punching out holes in highly abrasive asbestos shingles.

The four drawings in Fig. 5 show, in sequence, four carbide dies used for the first, second, third, and fourth forming operations to shape the bottom of a ferrule. The part is of nickel iron. Operations differ mainly as to die size and amount of draw or decrease in diameter as the end is formed. Large quantities of these parts are produced on eyelet machines. The present carbide dies have produced some 3,000,000 parts and are not yet worn out. According to the manufacturer, tool steel dies had practically no life at all because the die continually picked up metal and scored the work.

Fig. 6—A die used to clip the flange from a candelabra size lamp base. The base is brass or steel, and an eyelet type machine is used. A carbide die life of only 10 to 15 times that of tool steel has been experienced here. The small increase is due to the fact that carbide dies fail, not from wearing out, but due to accidental abuse of the die. Under normal conditions increased performance in the order of 50:1 could be expected from carbide dies on this application.

Tubes for thermostat bellows, usually of soft brass, bronze, or monel metal, are produced with the die shown in Fig. 7.

These carbide dies were designed to fit into holders originally made for steel dies, which accounts for the deep case below the nib. The relatively light reduction involved permits a very shallow nib. Vertical crank presses and horizontal hydraulic presses are commonly

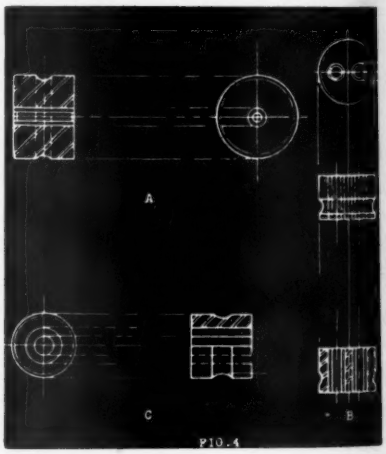


FIG. 4

FIG. 9

used for this type of work, with dies used either singly or in tandem. Parts must be uniform in size and have smooth

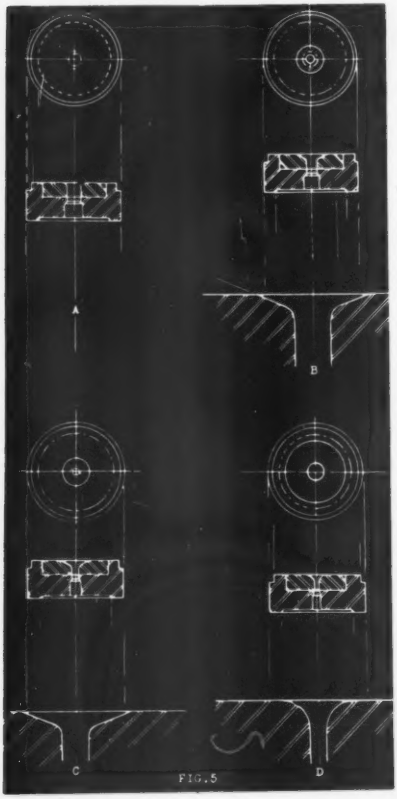


FIG. 5

surfaces. Approximately 2,000,000 parts are run a year. Carbide dies show an average of about 100,000 parts compared with 10,000 parts for an equivalent set of steel dies.

Fig. 8 shows two eyelet type dies. At

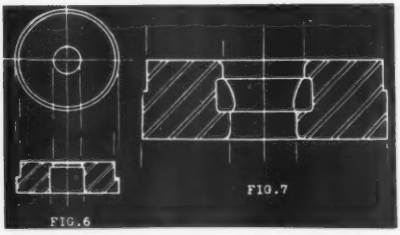


FIG. 6

FIG. 7

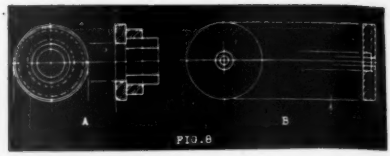


FIG. 8

the left are the upper and lower dies for a tandem drawing operation. Materials drawn are brass, aluminum, and steel, although recently steel has been used more extensively than the other two metals. Special multi-spindle presses of the manufacturer's own design are used, and millions of pieces are produced. Before the draw, the part is a round slug cut out by the dies shown at the left. The finished part is a shoe eyelet. The eyelet-forming dies are shown at the right. Here, the blanking punch could not be produced by shearing it with the carbide die. Accurate alignment was essential for blanking and special machinery was designed with guides to insure such alignment.

Fig 9 shows carbide punches and dies for producing bottle caps. Inch round discs are punched from tin foil strips 0.0025 to 0.003 inch thick and stamped into the cork insert in metal bottle caps on an automatic machine. Approximately 280 caps are formed per minute. Before using carbide faced punch and die assemblies, tool steel punches and dies had to be ground at approximately 50-hour intervals. The total average life

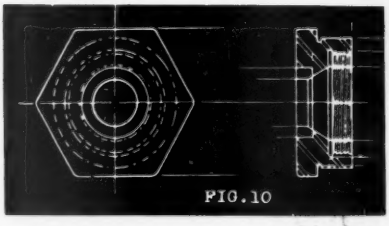


FIG. 10

was 25 grinds. With carbide tools, life between grinds has been increased to an average of 1000 hours and a life between grinds of 2800 hours for punches and as long as 5000 hours total punch life has recently been secured with this installation.

Fig. 10 shows dies for punching holes in highly abrasive ½ inch thick plaster board having a center of gypsum material with heavy paper on both sides.

*(TO PAGE 140—PLEASE)*

# THREE-DIMENSIONAL CONTOUR CONTROL ADVANCES ART OF PATTERN AND MODEL MAKING

First officially disclosed by the Automotive Council for War Production of Detroit a new contour controlling technique bids fair to revolutionize the making of plaster models to intricate contours or profiles. A West Coast development, the equipment is known as the Contour Developer and is a product of The Contour Company of Pasadena.

Reference to Fig. 3 identifies the principal piece of equipment as a base surface plate. This is a scraped surface plate in the form of a hollow rectangle and, in addition to its mechanical supporting and assembly functions, its plane surface is used as the datum or reference plane with which the master or loft drawings are to be oriented.

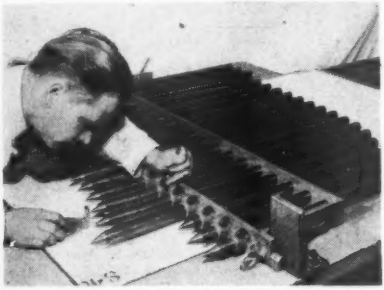


**Fig. 1—Contour points of one pin frame being set to contour line on master drawing.**

Working from this base plate reference plane the three-dimensional contours of the model are established by the several pin frames. A pin frame, Fig. 1, consists of a single row of vertically adjustable rods terminating in symmetrically ground contour points.

The ingenious use of the base reference plane in combination with a plurality of pin frames (laterally positioned along and within the base plate rectangle) whose rows of contour points are adjusted to the vertical contours called for at the respective horizontal stations results in a three-dimensional pattern of points accurately reproducing the calculated shape of the model or mold.

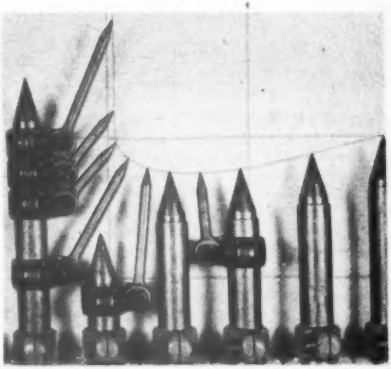


**Fig. 2 — Close-up of contour points aligned over contour drawing. Note use auxiliary points to conform to shorter radii.**

**Fig. 3—Pin frames being located on base surface plate.**

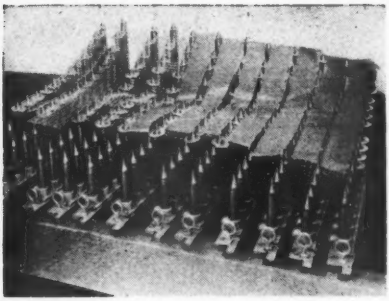


**Fig. 4—Completed assembly of pin frames in base surface plate. Note gage washers over contour points for uniformly locating wire mesh foundation for the modeling clay.**

The method of setting the pin frame contour points to a master drawing, loft layout or template is clearly illustrated in Fig. 1. The drawing is positioned on a set-up table and is oriented relative to this base line as determined by two angle surface plates, one of which can be seen at the edge of the set-up table. In relation to the drawing and the finished model the clamping surfaces of these two angle surface plates correspond to the supporting surface of the base surface plate, Fig. 3. A pin frame, loaded with contour point rods, is laid on the drawing and clamped against the angle surface plates. The contour points are then individually set to the contour line. The accuracy of these settings is assured when the operator uses a small 90° angle block similar to a "toolmaker's knee" for projecting the position of the contour line upward to be precisely met by the contour point.

It is important to note that, in those cases where the Contour Developer is being used for making a plaster pattern of a punch or die, allowance can be made for the exact thickness of the sheet that will be used in fabricating the finished product by securing a shim of the same thickness to the face of the angle knee. Thus the contour points as well as the finished punch or die are automatically compensated to "one metal thickness" of the shape of the finished product.

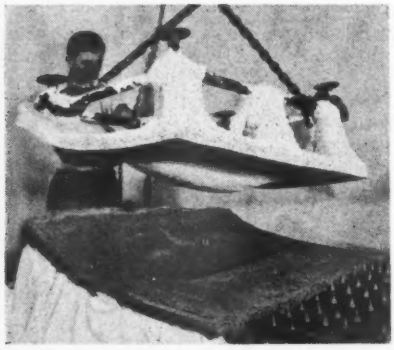


**Fig. 5—After plaster is cast on top of clay and has set, it is removed by means of its cast-in supporting structure.**

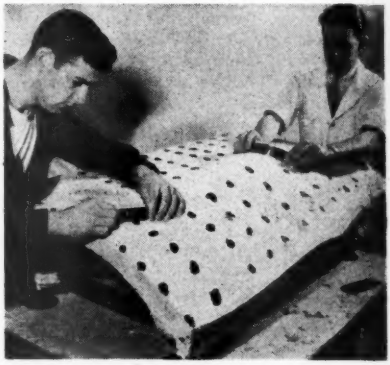


**Fig. 6—The plaster profile being shaped to final accuracy. As plaster is removed the colored spots diminish in size as the apexes of the inverted conical depressions are approached.**

After each contour line is transferred to the contour points of a pin frame, the successive frames are correctly located and clamped on the base surface plate, Fig. 3.

The nominal spacing of the contour point rods within the pin frames and the adjacency of the pin frames as mounted on the base surface plate result in a normal coordinate pattern of 2½" squares. Closer spacing, down to increments of approximately ½", can be attained by the use of accessory fixtures that permit interposing auxiliary points between the main contour points. This feature is clearly depicted in Fig. 2.

When all the "contoured" pin frames are locked in place on the base surface plate the multiplicity of contour points

accurately conforms to the finished three-dimensional profile, and the set-up is ready for the transfer of this geometrical pattern to a material substance.

A gage washer is dropped over each conical contour point. These gage washers are uniform and symmetrical and serve to accurately support strips of metal lathe or wire mesh which in turn serve as a foundation for a layer of modeling clay. These steps in the procedure are shown in detail in Figs. 4 and 5.

The clay is then roughly faired to become approximately parallel to the finished profile by leaving the contour points protruding through the clay by about 1/32". Care should be exercised at this point to make sure that the clay is faired with sufficient accuracy between the points so that the following cast of plaster will be more than adequate as regards the finished profile; in other words, so that none of the finished plaster profile becomes, instead, a "piece of air"!

The clay mold is now ready for the pouring of the plaster or Hydrocal cast. The frame or supporting structure for the plaster cast is accurately located and installed by being suspended from height blocks and a bridge during the pouring.

After the cast has set, it is removed from the mold by its integrally cast framework, Fig. 5, and is ready for the plaster fairing operation, being performed in Fig. 6.

This final fairing operation involves

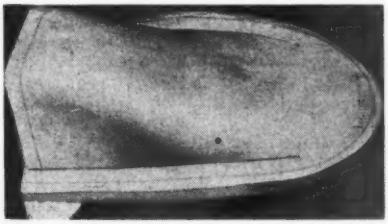


**Fig. 7—A plaster model ready for final trimming.**

one of the most ingenious features of the Contour Developer technique, i.e., the indentations in the plaster caused by the protrusion of the contour points

**Fig. 8—A finished model showing details of its supporting structure.**

through the clay mold are filled with a shellac of contrasting color. The plaster mold now only approximates the finished contour but its surface is patterned by inverted cones of colored shellac, the apexes of which form a pattern of the original, and hence, finally desired accuracy. Using spoke shaves and metal scrapers the plaster is faired and as material is removed the colored spots become progressively smaller. The scraping strokes should cover two or more color spots per pass in order that plaster be removed as uniformly as possible.

When the whole plaster surface has been reduced to a uniform pattern of barely discernible dots, representing the tips of the contour points, ultimate accuracy has been attained.

The plaster or Hydrocal is readily scraped and provides a hard, smooth precision surface.

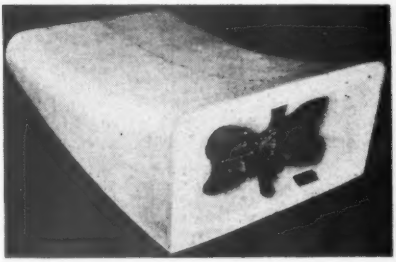


**Fig. 9—A hollow model with internal supporting structure.**

# APPLICATION OF COMPRESSED AIR SPEEDS NATIONAL ACME PRODUCTION AND CUTS COSTS

Few war production efforts were made under greater pressure than in turning out machine tools and aircraft parts. The National Acme Company of Cleveland has played and is still playing a vital role in delivering these two classes of products on time and in quantity. Dozens of examples of how war production needs were met can be found in this company's two big plants, where multiple-spindle screw machines, airplane brakes and wheels are made. Not the least of these examples of production short-cuts is their liberal application of compressed air to everyday jobs.

An approximate volume of 3000 cubic feet of air per minute is compressed and delivered at 100 pounds per square inch pressure to power numerous operations at the two plants. The 10-acre machine tool plant has an air hose at every production machine for the usual purposes of cleaning chips from work. This avoids the little delays that occur when two or more operators must share the same air hose. With several thousand workers, many little savings add up to an impressive total in time, dollars, and production.

**Fig. 1—Compressed air powered straightening and bending hammer.**

**Fig. 2—Pneumatic grinder used in preparing a spot on a forging for a hardness test.**

However, the company did not stop putting compressed air to work after caring for the most obvious and common use in a machine shop. Figure 1 is a view in the blacksmith shop. C. W. Robinson, superintendent of maintenance for National Acme, explains that compressed air is the logical power for the staightening and bending hammer in the picture because compressed air is immediately available.

Small pneumatic tools play a part in building big machine tools. In Fig. 2 an air operated grinder is being used to grind a spot off a forging in preparation for a hardness test. The workers like

this type of grinder because it is portable and easily handled, one of the little things which in the aggregate helps the machine tool builder deliver the goods on time.

Quick handling of work is another way to meet production quotas. Figure 3 shows a worker cleaning a motor cover. The air hoist helps him complete the job quickly.

Many parts for new Acme-Gridley automatics, such as shown in Fig. 4, are made by similar machines, equipped with air chucks to provide for fast handling of work and positive, vibrationless action because of the uniform air pressure on the part held in the machine. One of the values of an Acme-Gridley automatic screw machine is that it performs sev-

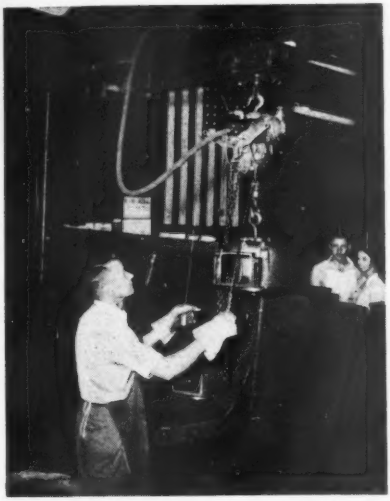


**Fig. 3—Air operated hoist speeds dunking operations.**

eral operations in a fraction of the time that a single-spindle machine could do the same work; so it is not surprising to find the machine tool builder using automatic chucking in its own plant as well as so equipping the machines it builds for other plants.

Rebuilding old machine tools to new efficiency has been an important part of National Acme's efforts. When these old machines come in, one of the steps is a thorough cleaning to remove all grease and grit. Figure 5 illustrates

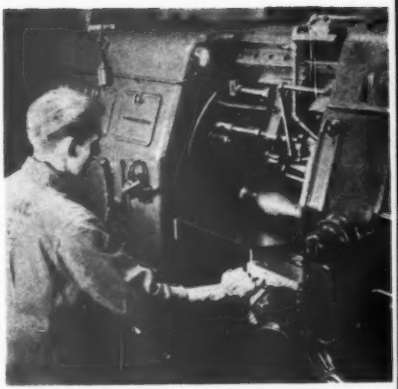


**Fig. 4—Acme-Gridley Automatics equipped with air chucks for fast, positive and vibrationless work handling.**

how compressed air is used in this operation. It is quick and reaches all points. The scarred castings, housing the machinery, are refinished in one of two compressed air-operated paint spray booths where new and old machine tools are painted faster than it is possible by hand methods.

Modern paint spray methods are applied, too, in the airplane wheel and brake plant, separate from the machine tool plant, as shown in Fig. 6. In collaboration with Goodyear Aircraft Company, National Acme developed a metal disc-type airplane brake and wheel assembly which is used on bombers, transports and other types of planes. In

**Fig. 5—Compressed air is used in cleaning old machines preparatory to rebuilding.**

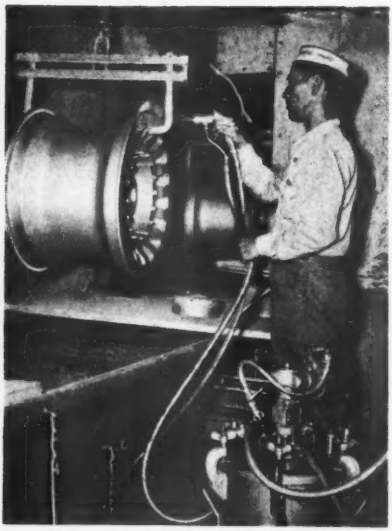


**Fig. 6—Modern paint spraying methods call for use of compressed air.**

a separate plant, the company is making these aircraft assemblies for Goodyear.

Production on airplane brakes and wheels is being speeded here as well as in the making of machine tools. In addition to supplying pressure (75 pounds) for spray guns in the booth where airplane wheels are painted as fast as they move through on a conveyor line, compressed air speeds production in assembly and testing.

**Fig. 8—Brake assemblies are tested for leaks by applying compressed air through the bleeder connection.**

**Fig. 7—Air operated impact wrench used in assembly operations.**

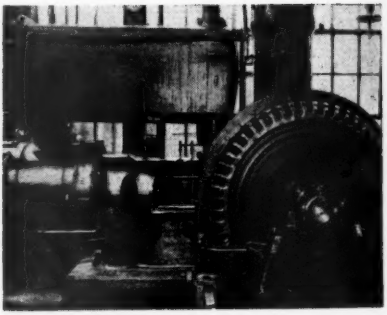


**Fig. 9—One of National Acme's three 1000 cfm motor driven air compressors.**

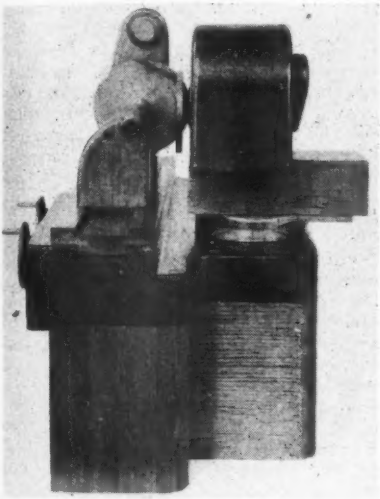
Figure 7 shows an operator putting assembly keys into the anchor bracket for a brake. He is using an air-operated impact wrench, with which the dozen benches for this work are equipped.

*(TO PAGE 140—PLEASE)*

## Wooden Models Help Machine Development

Wooden models recently helped General Electric's Lynn River Works Supercharger Division arrive at the best design for a machine to handle the difficult job of grinding integral wheel and shaft assemblies.

No standard grinder with both capacity and versatility to handle the job was available. Four angles ranging from zero to 90 degrees were required on each



**A quarter-size wooden model of a proposed grinder permits visualizing the final design and gives a positive check on the convenience of the operating controls.**

side of the wheel, and several diameters had to be ground on the shaft. Either a specially constructed machine or a converted grinder equipped with raising blocks and an extra swivel under the wheel head was required.

Quarter-size wooden models of machines proposed for the job were made by both the pattern shop and the machine tool manufacturer. In each of the models the essential parts—the slide unit and its base, swivels, and ways; the table top with its headstock and footstock—were made accurately. For economy, however, the ways were simplified to dovetail or tongue and groove, but were correctly located and marked as to limits of travel.

The completed models permitted every relationship between wheel and work to be duplicated quickly and accurately to determine capacities and limitations of the machines. Special features of the machine were easily demonstrated.

These models not only helped design a machine for a difficult job, but simplified the training of inexperienced operators in its use. Critical materials and man-hours have been saved. The models are now being used to further improve methods and plan new work.

## Broaching Stator-Core Slot Openings

Broaching the narrow opening of the slots in the stator cores of small precision-built motors to remove burrs and small stacking irregularities is considered the most effective method for doing the job at General Electric. C. W. Flanagan, an assistant general foreman at one of the Company's plants, developed the method. It offers definite advantages over others tried. Filing, for example, tends to open up the end section of the slots and not clean up the center section.

A broaching tool with a lead and one set of cutting teeth is started in the core by hand. Tool and stator are then placed in a holding fixture with a cap for each end which fits tight to prevent flaring of the end punchings. A small power broach is used to force the tool completely through the core, letting it fall into a padded receptacle to prevent breakage. The broaching tool is "floating" with respect to the ram of the broach because of the "skew" or angular pitch of the slots.

Cores worked in this manner are suitable for winding with the finest wire, either by hand or mechanically. Also, width of openings can be held to the proper size and maintained throughout their entire length. Not only is a better quality obtained, but cost is considerably less and time required for broaching is about ⅛ the filing time.

# "TOOLING" A PERSONNEL PROGRAM FOR THE SMALL SHOP

By Paul H. Baisch

The usual conception of personnel management places too much emphasis on the big corporation. There are many small shops very much in need of a sound, workable personnel program. Increasing labor costs and industrial unrest make the most efficient utilization of labor imperative to the small shop and its profitable operation during these war years as well as for the postwar period. Management is the use of materials and man-power in attaining an objective. Management has developed methods, tools, machinery and skills to efficiently process and utilize materials. Little, and often nothing, is done to secure the maximum productive efficiency from the man-power involved. This should be the aim of a personnel program.

### Labor Turnover

Before pointing out the personnel tools applicable to the small shop, it will be well to mention the desirability of attracting the right kind of employees, particularly in this period of man-power shortage. It is not only important to attract them, it is imperative to keep these employees with the organization. The cost of labor turnover is often neglected by management because it is so often looked upon as "intangible". Labor turnover costs are not as intangible as many suppose. There is the direct cost involved in the training of new employees, and in the period during which the employee is on the payroll but not producing at full capacity. This cost varies with the length of the training period. There are also costs from an increase in spoiled or wasted material, lowering of employee morale and increased overhead. From this standpoint alone it is well to develop a personnel policy and program that will attract the most desirable employees and that is designed to keep them with the company.

In a small shop there is a limit to specialization. It may be impossible to have even one man whose sole responsibility pertains to personnel management. Hiring and training may be the responsibility of one member of the organization, whereas sick benefits, employment records, savings associations may be handled by the auditor or an accountant or, as is frequently the case, each department foreman may do his own hiring and personnel record-keeping. Regardless of what the situation in the individual shop may be there are certain personnel principles and personnel tools which can be applied to develop a sound program.

### Unified Personnel Policy

The first step in developing a personnel program for the small shop is to set up a definite policy which will insure uniform relations with the employees. Standards for selection of employees, wage policies and scales, provisions for promotion and transfer, working hours, rules (and penalties) concerning discipline and behavior and provisions for training, should all be firmly established and made known. New employees, it follows, should immediately be made familiar with "company policy". It is

well for open-minded management to periodically review the personnel policy in order to improve or add to or subtract from it as experience dictates.

### Administration Authority

The next step is to fix the authority for the administration of personnel policy. If the plant is of sufficient size a personnel manager is desirable, his authority emanating from a top official in the organization and his responsibility being directly to that official. In the smaller shop the manager or some other executive may have to assume this authority; in any case authority must be fixed. It is important for employees to know who heads the personnel function. They must know who is responsible for their job relations, and know the individual to whom they can take their problems. It is of utmost importance that authority be established and that supervision, management and labor be fully informed as to this authority.

### Employee Records

Employment records are an important tool. An efficient but easy-to-manage record system makes use of an individual employee envelope. This envelope is 9" x 11½" and has the name of the employee on the tab and the employee's application, birth and citizenship certificates inside. Other "personnel tools" will be developed later in this article which are also to be filed in this envelope. All records are thereby together and can easily and handily be maintained in a convenient correspondence file drawer.

In a small shop, complicated merit rating systems, promotion and transfer plans, service rating plans admittedly are impractical, and yet the information which these systems are designed to gather, is needed. A simple time-saving solution to this problem is the use of a personnel report form. These report forms are used by supervision to report, only when and as such may occur, any outstanding work performance, breach of discipline, progress of employee on the job, development of new skills, absence, attitude and/or change in work attitude, or any other important phase of the employee's work activity. This information is written on the personnel report form, dated, signed by the supervisor and given to the individual in charge of personnel; it is then filed in the employee's envelope. This tool accomplishes two objectives: it keeps the personnel authority informed as to the employee and forms a permanent record of the employee for use in promotions, upgrading, counselling, discipline, and any union negotiation of a grievance with a minimum of record keeping and red tape.

### Training Program

An established training program is an important phase of personnel responsibility, and can be simply and effectively inaugurated in the small shop. On-the-job training has long been recognized as one of the more important training methods and is particularly applicable within smaller organizations. There are many direct benefits from a workable training program. It reduces labor turnover, improves the quality of work performed, reduces absences, tardiness and accidents, facilitates the discovery of promotion-worthy employees and tends to lower the unit costs of labor. The training program should be under the direct supervision of the personnel authority. Supervisors in the small shop must be called upon to give much of the preliminary on-the-job training. Training the new employee should begin with an explanation by the supervisor of company products, policies, regulations, and an explanation of the importance, in their manufacturing setup, of the first job the employee is to learn. Key workers in each department should then take over the actual job instruction of the employee. Worker-instructors should be carefully selected, not only for craftsmanship, but for their ability to explain and show how the job is done. It does not hold true that the best worker is the best instructor. The instructors in each department should themselves receive basic instruction in training methods. There is much excellent written and visual-aid material available for such instruction which is brief and well presented. It is obviously impossible to design one training program that will meet the specific needs of each and every shop;

but there are certain general rules covering the establishment of a training program that are of universal application. A preliminary survey will indicate the training needs, and these needs, in turn, will define the types of training to be devised. These can be on-the-job, visual-aid, textbook, or lecture, separately or in combination. It is then necessary to establish a definite end-result for each type of training offered. Selection of instructors to carry on the program, selection of employees to be given the training and the periodic reporting of individual progress under the program, follow in logical sequence.

### Employee Morale

Employee morale is becoming an ever greater factor in industrial relations. Many operating men may feel that this is a phenomenon caused by the strenuousness of wartime, high earnings, unprecedented demand for all types of skills and labor, and a deterioration of the average caliber of the workers in industry, due to the flood of inexperienced workers and the demands of our armed forces, and many other comparable reasons. These current factors have, of course, contributed to the increased labor-relations problem of management but it is a grave mistake for management to believe that the old "status-quo" will ever again be accepted as normal. Labor is on the march, we see it unmistakably in the unionization of large scale, mass-production industries, in the political accomplishments of organized labor and in labor and political campaigns for increasing minimum labor standards by statute.

What is morale? It is the state of mind of the whole group of employees; it is the collective attitude toward their work, toward management and toward all the conditions that at a given time determine their relationship to the organization.

What is management's interest in morale? Morale is directly related to labor costs. Lower labor costs permit higher wages. Productive efficiency fluctuates directly with variations in morale and interest. Employees do more work and do it better when they are enthusiastic about their jobs and surroundings. Lack of morale shows itself in increased absenteeism, tardiness, listlessness and stalling on the job.

Large, progressive corporations have long recognized the mutual need for high morale in industrial relations and have established elaborate and expensive programs to develop job interest and enthusiasm. But what for the small shop? Economically it is not feasible to hire a staff of personnel experts and develop a high geared personnel program with its myriad of functions and departments, i.e., Selection; Training; Wage Plans; Promotion and Transfer; Morale; Health; Employment Stabilization; Collective Bargaining; Personnel Services (recreation, housing, savings associations, credit union, old age pensions, insurance) and Personnel Research.

### Labor-Management Committee

One practical and usable plan for the small shop in building morale and interest is the establishment of a Labor-Management Committee. Such a committee is made up of three to six workers and an equal number of management executives. If there is a union in the plant the president of the union should be among the labor members of the committee. He is most important in the establishment of a workable committee. The other labor members should equitably represent all departments in the plant. Members of the committee should serve from six months to a year. Labor members may be elected by their coworkers or appointed by their union president. Management's representatives should come from the operating, financial, and engineering departments and each member should be a responsible executive with authority to speak for management and ability to express management's viewpoint. Meetings are best held weekly.

Some antagonism to the Labor-Management plan has been voiced by "old-line" management men. They don't want their workers telling them how to run their business; it's their business and they will "run it or else". This attitude has repeatedly met with failure and has resulted both in low productivity because of employee unrest and, more directly, in actual strikes. The function of a Labor-Management Committee is

not to run a business. It can, however, be a very efficient agency to promote understanding between labor and management. Such a committee is not interested in establishing company policy toward sales, finance or the administration of the business. Its function is that of personnel and employee welfare, i.e., morale. It is this phase of management that primarily concerns the worker. The committee is not interested in "telling" management; it is interested in intelligently discussing problems that are of mutual concern to both labor and management. The Labor-Management Committee discusses a problem and recommends a solution to "top management" for their or his consideration. It is not an "executive" body in the direct sense of the word.

What are the advantages to management of such a plan? Management thereby has the pulse of the workers, it knows how they feel, how they react, what they are thinking, and why. It becomes an opportunity for management to know the men, to see their viewpoint, to anticipate their needs or demands. What executive worthy of the name is not interested in knowing the attitude of his employees toward him, the company, its policies and its administration? A Labor-Management Committee is a "sounding board" for management and a "safety valve" for employee unrest, both so increasingly important to successful industrial management. The committee is an important source of ideas, efficiency suggestions and also serves as a check-up on department functioning.

### Committee Activities

A Labor-Management Committee can carry on many of the necessary personnel functions, particularly toward the building of employee morale. The committee can sponsor a company newspaper. Such a house organ does not have to be elaborate to accomplish its objective. "Reporters" are recruited from each department to write up the news of their respective groups and activities. A house organ sponsored and edited jointly by labor and management is an important morale builder, and management is, at the same time, given an excellent medium for informing the employees of policy, company business activity and for instructing them in safety and job practices.

War Bond Drives, Red Cross, Community Fund, etc., can be handled quickly and efficiently by employee participation. A Labor- Management Committee can set up and administer an employee welfare fund. In one plant this was financed by proceeds from labor-management sponsored vending machines and labor-management sponsored social functions. These committees are excellent agencies for recruiting new employees.

Labor-Management Committees have made real contributions to plant efficiency and general cost cutting through committee conducted "suggestion plans". Employees originate suggestions on increasing production, cutting costs, plant cleanliness and safety precautions, and even new products. Awards are presented to winners as judged by the committee. The committee can administer departmental housekeeping contests, monthly slogan contests, and can sponsor interdepartment sports contests such as bowling and baseball. During the war, assistance in rationing procedures and arranging employee transportation via share-the-ride groups have been important functions of many committees.

Through the weekly committee meetings, labor has an opportunity to appreciate the difficulties and perplexing problems of management and acquires a new respect for the men who must make the decisions so vital to the conduct of the business. The employees feel they are taking a part in the daily affairs of their company. They develop interest in the company, they learn to appreciate the importance of their sales department, their accounting department, the pressure on their engineers and supervisors. They begin to think of the shop as "their company" and take pride in it. They learn the value of tolerance so greatly needed by all today. A Labor-Management Committee can do much in all these ways to improve the human relationships within a shop.

### Safety Programs

A safe shop is good business. Accidents are costly to management not

only in lost time but in the weakening of employee morale in addition to direct cash outlay. Workmen's Compensation Acts have materially and favorably affected the ratio of employee accidents to operating costs. In 1907 The United States Steel Corporation announced the obtaining of very satisfactory results from an experimenal safety and accident prevention program. Other corporations quickly followed suit and also inaugurated safety programs in their plants. Safety is recognized today as an important concern of management. There are in general two sources of accidents, i.e., personal causes and impersonal causes. Personal causes include accidents due to improper attitude, lack of knowledge or skill, physical handicaps and poor health. The impersonal causes are hazardous work handling arrangements or procedure, defective mechanical equipment, unsafe clothing or dress, crowded aisles, improper lighting and ventilation and inadequate guarding. The large organization has complex facilities to combat these causes of accidents, including safety engineers, safety inspectors, safety schools and training, vision testing equipment, psychologists and elaborate mental tests to determine the accident proneness of individual employees. But how can the small shop meet this problem?

### Safety Inspection

The personnel authority should appoint in each department a trusted employee as the safety inspector in his department. It is even advisable that the safety inspector be given a badge designating him as such. This serves as an appeal to his pride and enables him to enjoy a certain prestige. The inspector should receive instruction in accident prevention. Instructional material is readily available. The Division of Labor Standards in the Federal Department of Labor publishes a continuous series of pamphlets and booklets pointing to industrial hazards and the means of controlling them. Other sources are State Labor Departments and the National Safety Council, a private non-profit organization. It is well to further interest the employee safety inspectors by subscribing for them to one of the excellent safety periodicals. It is most important that any safety plan be organized so as to clearly demonstrate management's serious interest in the work. Some executive should participate in the plan. The logical executive is an engineer or the shop manager. Supervision must be also made safety minded. Half-hearted interest and cooperation on the part of supervision will defeat any plan. Labor must be shown that management is genuinely iterested in the safety and well being of all workers.

It is a good practice for the executive in charge of plant safety to hold weekly meetings with his employee safety inspectors. These inspectors should report to him on any unsafe conditions and careless workers in their departments. Some shops have found it valuable to hold shop wide, periodic safety meetings with all employees attending. This is an excellent means of making all employees safety conscious. It is most vital from the standpoint of safety and employee morale to correct as soon as possible any discovered accident hazard. Some executives may say "I'm in the shop the biggest part of the time and the shop is as safe as it can be with our type of operation". This can be true from a machinery and physical equipment standpoint, yet not true regarding the intangible and personal factor. This can only be attained by making the employees safety conscious. The individual employee is a large factor in safety engineering. Much good safety education can be accomplished through the use of the company's newspaper or through a safety educational program sponsored by the shop Labor-management Committee. Interdepartment safety contests with a box of cigars for the winning department or a safety pennant to be hung in the department are good means of creating interest and safety consciousness. A good safety program will pay off in dollars and cents.

Regardless of the size or type of shop operation, good employee relations are vital to any organization. The human element in manufacturing has long been slighted as an important factor in production costs. This article has attempted to point out to management a few of the many steps that can be taken to improve employee relations by, withall, a minimum of time, record keeping and red tape.

# GOVERNMENT-INDUSTRY COOPERATION IN VETERAN REHABILITATION AT CRILE GENERAL HOSPITAL

R. D. Harden, Col. Med. Corps., Commanding
Capt. Max Goldenberg, Med. Corps.

**by R. J. Albert**

In October, 1944, permission was requested of the War Department to institute an Industrial Therapy Department at Crile General Hospital such as had been previously started at Brooklyn Naval Hospital at Brooklyn, New York, and Birmingham General Hospital at Van Nuys, California.

The theory of the program was to get the men thinking about anything but their own disabilities and at the same time to prepare them in some small way for their return to civilian life. Furthermore, their recovery would be accelerated by the exercise of the limbs and muscles that had been dormant for long periods of time due to their injuries.

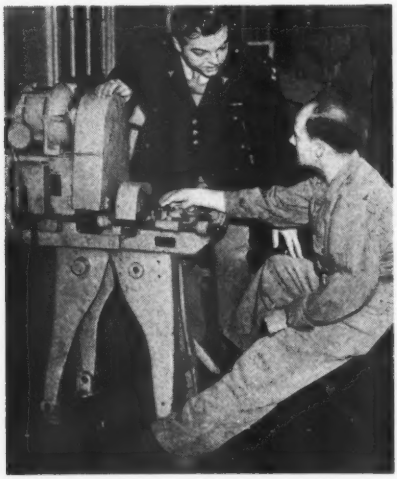
Authority was granted and the department became a part of the rehabilitation program at Crile General Hospital in December, 1944.

Capt. Goldenberg and H. J. McMahon, general manager of the Lamson & Sessions Company of Cleveland, organized a work shop, installing two table nutters, five semi-automatic Sawyer nutters,

**Preliminary group instruction. Assembling nuts on bolts being demonstrated on a Sawyer semi-automatic nutter.** *Photo courtesy The Cleveland Press*

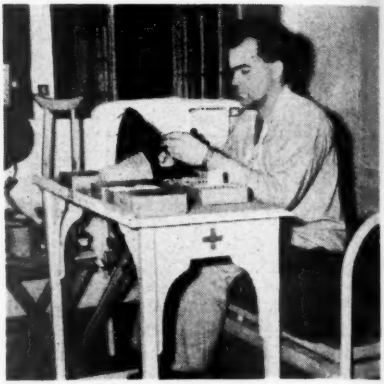
**This drill press quill feed was change over from the spoke type to a wheel crank and handle which offered greater muscular benefits.** *Crile Staff Photo*

two drill presses, two bolt pointers, reamers, and equipment for die filing. A lathe was set up for facing operations on aircraft parts.



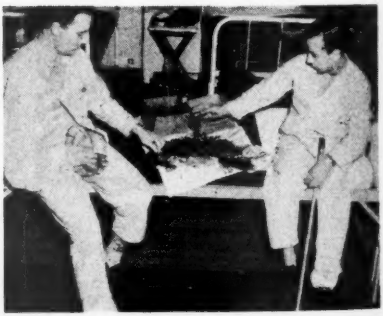
**Foot operated bolt pointer.**
*Photo courtesy The Cleveland Press*

The machines were rebuilt to incorporate operating controls that would benefit the leg, foot, hand, and arm muscles that needed the beneficial exercise. For example, one machine operation required merely the pressing of a foot



**Federal dial comparator setup for gaging pitch diameter of Ford-Pratt & Whitney aircraft engine studs.** *Crile Staff Photo*

lever switch control and the benefit to the leg and foot muscles was not noticeable. A new switch control was installed with a stirrup-like holder for the foot and the patient then had to use a swinging motion of the leg to operate the ma-



**Special dial indicator gaging fixtures for checking bolt lengths.** *Crile Staff Photo*

**Section of Crile General Hospital "war production line."**

*Photo courtesy The Cleveland Press*

chine. The results were outstanding and the same idea was extended to the other foot operated machines. Another change was that made on a drill press having the spoke-type control to raise and lower the spindle. This was replaced by a crank type wheel and the operator must now use a full circular motion of the arm to feed the drill.

The rehabilitation work was started on a large scale with but one idea, i.e., the therapeutic and psychological benefits to be derived by the patients.

The various jobs consist of filing and polishing operations on dies, drilling bolt heads, loading nuts on bolts both by hand and by semi-automatic machines preparatory to shipping, pointing bolts, facing and finishing operations on aircraft parts, and the inspection of nuts and bolts.

Bed patients in fifty-six wards are engaged in inspection work using length, diameter and thread gages. The work is most exacting as some tolerances are well within .001". The men never pass an inferior piece or one that is doubtful as they realize the danger that results from poor workmanship. The pieces to be inspected are taken to the hospital from the plant by a Lamson and Sessions truck as are all the other materials and work.

The volume of work turned out has exceeded all expectations and is on a steady increase. A true shop atmosphere is maintained at all times in the work shop and the men all ring time cards. The bed patients keep their own time. They are paid at the rate of 75¢ per hour which is the starting rate at the plant for new employees. The shop and wards all have their foremen and the Lamson and Sessions Company sent

*(TO PAGE 137—PLEASE)*

**Bench work such as die filing is most beneficial exercise for shoulder, arm, wrist and finger muscles.**

*Crile Staff Photo*

# AMERICA'S NEW DIAMOND DIE INDUSTRY

Small diamond dies, used to draw millions of miles of filament and resistor wires for wartime electronic equipment, are now precision made by American workers. New scientific methods are being used in diamond die production and are replacing the hand drilling and laborious polishing previously done by French and Netherlands craftsmen, the War Production Board has reported.

The latest electronic developments depend on "invisible" wires drawn at high speeds through precisely drilled diamonds. Microscopic drilling through rough ½-carat diamonds precedes the mirror-finishing of the bores through which various metals must be extruded at high speeds without breaking in order to produce wires some of which are less than .0008" diameter.

Invisible to the naked eye, the resultant superfine wires are used for electronic devices, or even woven into a "cloth" utilized in the manufacture of high explosives. Every walkie-talkie, the radio and communication system for every tank, jeep, bomber, fighter plane, PT-boat, submarine, destroyer, cruiser and battleship, all require platinum, nickel-chrome, copper, aluminum, steel, molybdenum or tungsten wires drawn through diamond dies. The wires are fashioned into resistors, lamp filaments, grids for midget vacuum tubes, even photo-flash bulb "fuzz," often finer than spider web threads.

Die manufacturers are adopting new electro-mechanical methods of drilling diamonds with a remarkable decline in die costs and increasing quality and quantity of superfine wire production. Important new discoveries point to diamond die production in six man-hours against even the present record of 20 man-hours per die, according to officials of WPB's Miscellaneous Minerals Division.

"The great future of small diamond dies is linked with electronics," Athos D. Leveridge, chief of the Diamond Die Section of WPB, has said. "Use of electronics in many phases of warfare will be transplanted to civilian uses. Tremendous civic, medical and civilian demands for television and miniature radios will pyramid both in variety and quantity."

Prior to 1939 our relatively minor requirements for small diamond dies were filled by hand craftsmen in France and the Netherlands. Their skill in drilling diamond dies for drawing filaments of gold, silver, bronze, etc., for weaving into gold braid, embroidery and ornaments, had been passed on from generation to generation. After 1939 these diamond die imports stopped.

Demands arose for huge quantities of fine wire in this country, principally for electronics. Diamond dies in America were "frozen."

Searches were made for the few American artisans and European refugees who could drill diamonds. Tools and skills were scarce, but several small shops were soon built around men and women who could produce diamond dies.

This hand-craft method, however, could not bring production up to scheduled proportions nor serve as a model for American firms to follow. Government-sponsored, as well as private firms, refined the large die multiple-spindle drilling methods until greater speed in manufacture and use of less personnel resulted. Automatic processes were installed wherever possible. Perfection of die drilling machines also considerably extended the die life. Instead of drawing only two pounds of wire equivalent to 200 miles, 25 pounds of wire were drawn through some of the new dies to produce, in exceptional cases, as much as 2500 miles of wire. Production of diamond dies has risen from a start of 1200 in late 1941 to an annual rate of 30,000 by the end of 1943.

The small diamond die industry is on the threshold of attaining inexpensive commercial drilling of diamonds, WPB has disclosed, through the application of an electric spark. The electrolytic predrilling operation employed in the new process consists of shooting an electric spark into a diamond from a platinum needle while both are immersed in a chemical solution. Such action drills or "burns" a microscopic cone in the diamond, which subsequent polishing forms into a finished die. The process promises highly significant results and finer dies at lower prices may soon be available to the wire drawing industries.

# NTDMA OBTAINS CRITICAL ACTIVITY LISTING FOR TOOL AND DIE MAKING

The National Tool and Die Manufacturers Association, 1413 Union Commerce Bldg., Cleveland 14, Ohio, has recently received a letter from the Essential Activities Committee of the War Manpower Commission, Washington, D. C., which states that the manufacture of special tools, dies, jigs, fixtures, gages, molds, and especially designed machines has been included among the critical activities. The production of this equipment is covered under broad terminology used in Groups 15 and 16 of the WMC list of essential activities and has recently been sent by selective service to local boards as a guide in making deferments, although the list does not specifically mention tool and die manufacture.

Concerning a specific registrant it is still the responsibility of the local board to decide whether the specific establishment and registrant's employment within that establishment are in support of the war effort. Special procedures apply to the registrant's ages, 18 through 25 and ages 26 through 29.

# BRITISH INDUSTRY TO COOPERATE IN RESEARCH

A new spirit of collectivism is gaining favor in Britain in the scientific and technical fields. During the present war period vast numbers of highly trained and expert workers are daily concentrating on special technical inquiries and scientific research to enhance the war effort and to prepare British industry for the post-war world. Many important discoveries and inventions have come from Britain's large research laboratories of scientific, semi-national or national institutions and from research laboratories of private firms.

These discoveries will not be so jealously guarded by Britain in the post-war world as they have been guarded in the past. Scientific secrets are now not easily kept. Trained technicians are able to reason from effect to cause and modern analytical methods quickly reveal the composition of any "secret" substance.

British scientists and technicians have come to realize that in the post-war world they will gain more from a common interchange of ideas and experiences, rendering whole fields of research accessible to each other, than from withholding scraps of private knowledge. The British technician will have fewer individual secrets, but will foster a far greater collective scientific progress in Britain.

The editor of a large British technical house journal, published by a steel firm, has stated clearly that following the war he will include in the pages of his publications only the results of his company's research including series of formulae by means of which other engineers will be able to achieve certain technical results more efficiently, and practical operating hints by experienced workers that will save money. In general, this editor will publish only valuable material about his firm and its activities.

The rate of progress has rapidly increased. Processes, operations, treatments, machines, compositions evolve and change, modify and disappear with a rapidity that would have stunned an engineer sixty years ago. If this is so today when it is necessary to keep many activities secret how much greater the speed of progress will be when British manufacturers pool their discoveries and resources.

It is not likely that all British industrialists will immediately adopt the new spirit of collectivism in research. There is bound to be a lagging behind by firms who believe there is personal gain to be had in keeping new developments secret. But the modern, progressive, well organized firms, on whom Britain depends for her industrial challenge to the world, have no illusions. They know that Britain can only regain her prominent position in the industrial world by a giant cooperative effort by her manufacturers and that this cooperation implies the regarding of every discovery as a British rather than a private affair.

## Postwar Outlook for Stampings

The outlook for postwar markets for stampings was a subject of discussion at recent district meetings of the Pressed Metal Institute held in Toledo, Detroit and Worcester. R. A. Dadisman, Chief of the Market Development Div., American Rolling Mill Co., who spoke at the meetings in Toledo and Detroit, highlighted the opportunities for greatly increased use of stampings postwar and underscored the importance of training representatives of stamping concerns to serve their customers as "product engineers" in order that they can be specifically helpful in solving design and production problems.

The Toledo meeting was attended by some 35 members of the Pressed Metal Institute. District Chairman, E. M. Tasker, vice president, Toledo Stamping, presiding. Mr. Tasker was re-elected chairman of the Toledo district.

G. H. Roberts, president, Detroit Stamping Co., presided at the Detroit meeting which was also well attended. Mr. Roberts was re-elected district chairman and appointed the following committees: Membership Committee—F. W. Beyer, National Stamping Co., Chairman; Don McLouth, McLouth Stamping Co.; R. C. O'Brien, Means Stamping Co. Program Committee—George J. Herman, Bowen Products Co., Chairman; Nick Nolan, Advance Stamping Co.; F. G. Whitehead, Whitehead Stamping Co.

Carter C. Higgins, vice president, Worcester Pressed Steel Co., was elected district chairman for the New England group at the meeting in Worcester where a round table discussion was held on subjects of immediate importance to the New England members including shortage of tool makers and conditions affecting shipments.

★

The Massachusetts Division of University extension, 200 Newbury St., Boston, Mass., offers courses in Chemistry of Plastics, for those with a foundation in Chemistry, Use of Plastics, drafting, and designing. The following subjects are offered to provide a good foundation for the course in Chemistry of Plastics: Elementary Chemistry, General Science, Inorganic Chemistry, and Qualitative Chemistry. All of these courses are offered in the evenings at moderate fees.

## South American Sales

The American Import Company, of 62 First St., San Francisco, Cal., is in a position to represent manufacturers whose products can be sold in the South American countries. The American Import Company is widely known in the San Francisco and exports markets as a most capable firm enjoying a successful export merchandising record. Domestic manufacturers with a postwar eye to South American markets will be furnished all needed data covering the services provided.

★

The National Board of Directors of the Society of Plastics Engineers named the following national officers for 1945: William B. Hoey, President; George W. Clark, Vice President; and L. S. Shaw, Secretary-Treasurer. Three new national directors were named: E. S. Rinehart, J. O. Reinecke, and F. J. Ackerman. Mr. Ackerman declined due to illness, and Thomas E. Orr was elected in his place. John A. Mickey was appointed Chairman of the New National Technical Activities Committee.

★

George O. Boomer, a member of the board of directors, and Executive Vice President of The Girdler Corporation, Louisville, Ky., has been elected President. Mr. Boomer is succeeding Walter H. Girdler, Sr., who died on January 7.

★

Gordon B. Thayer, Plastics Research Engineer at the Dow Chemical Company, and author of "Plastics Molds", was elected to membership in the SPI at the January meeting of the Board of Directors in Cincinnati, Ohio.

★

The Detroit Mold Engineering Co. have moved their general offices, formerly located at 4835 Woodward Ave., to the factory located at 6686 East McNichols Rd., Detroit 12, Michigan. A new improved plant building with ample space for the offices and engineering department has been erected adjoining the manufacturing properties.

**Procedures in Plastics**

# DESIGN OF MOLDED PLASTICS PARTS

## INSERTS — PART 2

**By Warren V. Prince**

### Shrink-Fit Assemblies of Inserts

When it is difficult to hold an insert in place in the mold during the molding operation it is often possible and in many cases very practical to assemble the metal inserts into the molded part after the part is molded. However, the assembly must be done immediately after removal of the part from the mold and while the plastics material is still hot. A recess is molded into the part to receive the insert. As the material cools it will shrink tightly around the insert by thermal contraction. It is more practical, of course, to have the insert at room temperature at the time of assembly. This is not of great importance since the plastics material will shrink from 3 to 10 times as much as the metal insert even if they begin at the same temperature.

The size of the recess to receive the insert must be calculated and provided for in the mold to be the same size or slightly larger than the size of the insert while the mold is hot. As the material cools to room temperature the size of the recess must shrink to a size smaller than the metal insert in order to properly grip it.

For example, let us assemble a .500" metal ring insert into a recess in a general purpose phenolic which has a shrinkage factor of .006" per inch. We will assume a clearance of .001" on the diameter at assembly. The actual mold shrinkage would be:

.006" x .500" = .003"

After shrinking .003", the shrink fit assembly would be:

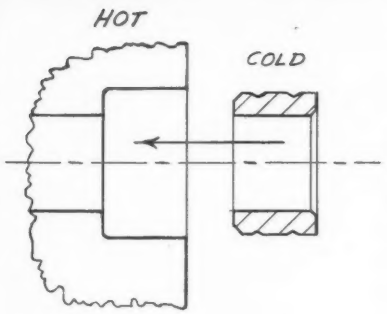
.003" — .001" (the clearance) = .002" tight on the diameter.

The core of the mold which molds the recess must be calculated to mold a recess of .498" in diameter in order that the recess size will shrink to that dimension if the insert were not put in place. The actual core dimension at room temperature or as it would be made in the tool room would be:

.498" + .003" (normal mold shrinkage as above) = .501", the actual dimensions on the core.

This illustrates that mold dimensions must be held closely. The tolerance on the O. D. of this insert should not exceed ± .001". If the wall thickness around the insert is sufficient to prevent cracking of the material upon cooling, it is better to hold the dimensions on the insert to the high side rather than to the low side. This may mean a slight effort in assembly but it will assure that inserts are tightly held after cooling.

All inserts for shrink fit assemblies should be slightly chamfered on their entrance side so that they can enter the recess easily. Assembly should be speedy as the metal insert is likely to




SHRINK FIT OF INSERT

**Fig. 6—The recess to receive an insert must be the same or slightly larger size than the insert because of the shrinkage differentials between plastics and metals. Since plastics materials shrink in cooling from 3 to 10 times as much as metal, the plastics shrinks to the insert and the tightness of the shrink fit is utilized as a holding means.**

cool the plastic and cause it to begin to shrink before the inserts are completely seated. When force is required for assembly or to assure alignment of inserts as they are pressed into place, a small hand press as an arbor or a bottle capping press can be used.

A shrink fit as given in the example above would be sufficient to hold the ring in place under normal conditions of mild shock but the designer must not expect such a fit to hold against an axial force of a pound or more attempting to dislodge the insert. The tendency to move out axially can be partially corrected by machining a small annular groove or two on the outside of the insert. Better holding or resistance to axial force is gained as the plastics material shrinks into the grooves. If the wall thickness and the shrinkage makes it possible a diamond knurl may be pressed in. This type has good torque and axial resistance.

A straight knurl, on the other hand, would have maximum torque strength for a shrink fit insert, particularly if pressed in by force so that the knurl would cut its way into the plastic. However, the resistance to pull would be poor.

When inserts are held in place in the mold by fitting into a recess or hole, hardened steel bushings are sometime used for long run molds to avoid the gradual loss of fit which otherwise would occur. Such bushings hold to size and are easily replaced.

An insert should never be assembled onto a plastics part when the material is entirely on the inside of the insert, e.g., a hollow shell insert placed over a plastics part. The plastics will shrink *away* from the shell, leaving it entirely loose. This is even poor practice with molded inserts due to shrinking away. Always consider the direction of shrinkage relative to an insert.

### Pressing Inserts in After Cooling

For assemblies on which no axial force is expected in service it is sometimes permissible to press the insert into place after the molded part is completely cool. Ordinarily the best practice is to use a straight knurled insert so that the knurl alone cuts its way into the walls of the molded recess as it is pressed in. The insert must not be permitted to "expand" the recess or cracking may result. This is the chief danger of pressing in inserts after cooling. Thermosetting materials in particular are quite easily cracked from expansion because they are hard and brittle and will not yield to expansion. On the other hand, thermoplastic materials are soft and more or less flexible and usually work out satisfactorily in such applications.

Molded parts subject to vibration should not utilize pressed in inserts because vibration will tend to loosen the inserts in time. This is particularly true of thermosetting materials due to their lack of resiliency.

A diamond or cross knurl insert should never be cold pressed into place since the pattern of the knurl will cut away the entire area of the contact face of the material as it enters and leaves no surfaces to hold it in place. The grooves of the knurl must run in the direction of the pressing at assembly.

### Lengths of Molded-In Portions of Inserts

The length that a molded-in insert should project into the molded part during molding is usually governed by the following conditions:

(1) The nature of contour or shape of the molded-in portion of the insert.
(2) The total area of surface of the molded-in portion of the insert, particularly symmetrical.
(3) Mechanical strength of the insert material in withstanding molding forces and flow of material against the insert.
(4) Pressure or force of flow of material against insert during molding, tending to dislodge or distort insert.
(5) Direction of flow of material against the insert during molding.
(6) Type of molding, i.e., injection, transfer, straight compression on hard material, high frequency compression, high frequency transfer, etc.
(7) Type of molding material.
(8) "Flow" of molding material (hard or soft flow).
(9) Molding technique, i.e., pressures, temperatures, gating, etc., as they affect distortion of inserts.
(10) Positioning of inserts in the mold relative to molding forces.
(11) Amount of torque, axial or pull, or mechanical strain on the insert in final service.

### Contour of Inserts

External sharp corners should be avoided on the portions of inserts extending into the molded part. Such corners cause stress concentrations in plastics material because it forms an "inside square corner" around the insert plus the strains developed in that corner due to molding shrinkage. Strains and stress concentrations lead to easy breakage. The remedy is to put a radius or chamfer on the edges. A chamfer is generally more economical and easier to produce in production than a radius.

The sharp corners on knurls do not seem to cause this trouble, probably because each sharp corner is so small in size and because they are evenly distributed. A sharp corner that projects prominently and for an appreciable distance on the insert is the type that causes the trouble. This trouble is normally not serious unless a considerable mechanical strain is put on the insert.

### Threaded Inserts

Metal inserts are used more often for threads than for any other single purpose in plastics applications. Both inside and outside threads are used. Since metal threads are many times stronger than plastic threads, the designer must exercise judgment in determining whether a plastic thread will stand up under a given application or whether a threaded metal insert should be molded in.

A first consideration is to design or employ an insert to prevent the plastics material from entering the threads of the insert either directly or by flashing. Another important consideration is that a substantial wall thickness of plastics

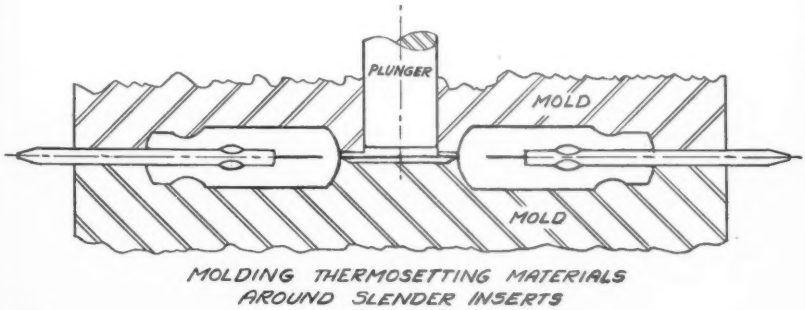



**Fig. 7 — Slender rod inserts in thermosetting materials are usually transfer or injection molded to prevent displacement or distortion of the rod.**

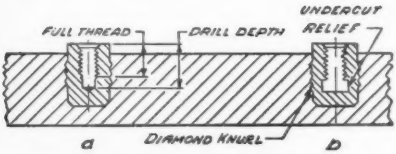



**Fig. 8—Diamond knurl female inserts are shown, both as blind holes. The relation of full threads to the drill depth is indicated. At "b" a relief undercut provides for tool clearance. Note the projecting of the insert from the molded piece and the chamfer on the insert.**

material be allowed around the insert to hold it firmly in place and to prevent cracking from mold shrinkage.

Threaded metal inserts are particularly necessary for small screw sizes of from No. 6 and smaller because it takes very little twist or torque movement with the hand to strip such threads made of plastics.

### Male Thread Inserts

In sealing off plastics material from a male screw thread projecting from the molded part, the thread should never be allowed to continue into the molded part because the material cannot be sealed off and kept from following up the thread of the screw. A shoulder should project from the molded part by approximately $\frac{1}{32}$" or more and to at least the major diameter of the screw so that it can fit into a hole in the mold and seal off the flow of material, in this way preventing it from entering the threads. The mating part can be made to clear such a projecting shoulder by chamfering or counterboring the thread entrance in the female part.

If plastics material should enter the threads a threading die must be used to cut the material out of the threads. In such an operation the threading die also removes part of the metal along with the material. This makes the metal thread undersize and produces a loose fit as well as adding another operation.

If the stock diameter of the screw comes through the surface to furnish a shoulder for sealing, the insert may simply be placed in a hole in the mold wall.

When the head of a screw is molded into a plastics part, a standard screw driver slot in the head of the screw should never be depended upon as the sole means of preventing the turning of the screw. Such a slot is usually too small in proportion to the screw size for such a purpose in plastics. The plastics material in the slot will invariably be stripped or sheared by turning. Use a knurled head, hex shaped head or some large irregular shape to prevent turning.

### Female Thread Inserts

A female thread, such as a nut, should not be left open at one end to plastics material during molding. The thread will fill. Even when a screw is put into the nut during molding and withdrawn after molding, flashing will occur up through the threads. This flashing not only makes the screw difficult to remove from the nut but requires a tapping operation to remove flash from the female threads. As some metal also is removed, the thread is left oversize resulting in an unsatisfactory fit.

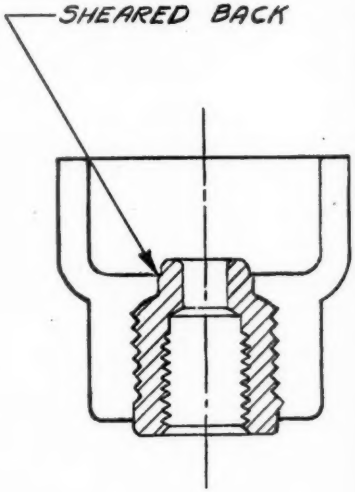



**Fig. 9—This female threaded insert extends through the molded piece. A shearing back seal is illustrated. The opposite end of the insert must be held in place during molding and must be above the opposite surface to take the stress of tightening force.**

The insert should be closed or solid in the bottom to keep out the plastics material. The top can be sealed by positioning the insert top 3/32" to 1/16" inch above the molded surface as a smooth diameter so that the insert can be pushed or tapped into a recess in the mold wall for sealing off. During molding plastics material is usually too thick to turn sharp corners while flashing to get around the end of the insert.

A female insert that extends completely through a molded piece and is open on both ends can be sealed off entirely by machining a pointed edge around each end of the insert. The overall length of the insert including these sharp edges should exceed the space for it in the mold by .010" to .015" so that as the mold closes it will flatten down the sharp edges on both ends of the insert and seal off the insert against the plastics material. This principle can only be effective, of course, when the mold closes *before* the material enters the mold cavity, as in transfer and injection molding. The pointed edge in flattening prevents a contraction of the entire insert and a distortion of the threads. This design is good for soft metal inserts such as aluminum or brass.

Another method of sealing is to leave the insert flat but to put a pointed edge on the mold. This edge should be a hardened steel bushing or plug inserted in the mold wall. This edge would sink into the end of the insert as the mold closes. The designer must be careful to avoid upsetting the end of the threaded insert inward toward the thread or distortion that would injure the functioning part of the insert in any way unless the insert is to be tapped or reworked afterwards.

Another method of sealing female inserts involves actual shearing back of metal as the mold closes upon it. This is done by making the diameter of the insert at the projecting end slightly larger than the diameter of the recess into which it fits in the mold. A sharp edge of hardened tool steel is left on the entrance of the recess so that the soft metal of the insert is sheared back as the mold closes. This affords very positive sealing. This type of insert must be held in place at its opposite end to guide it into the mold recess during the closing operation. In this case the mold must be closed upon the insert before the plastics material enters the cavity.

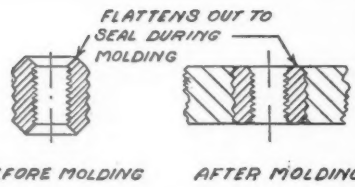



**Fig. 10—Good practice in sealing off the ends of a female insert that extends through a molded part. The mold in closing flattens down the sharp edges sealing off the insert against the material. This can be used only when the mold closes before the material enters the mold cavity.**

If a strong tightening force tends to pull the insert out of the plastics piece in service a provision should be made to bring the insert to the surface or above the surface so that the insert will contact solidly against the tightening force for support. If a flat plate is used in the tightening assembly the threaded insert should under no circumstances end below the surface of the molded part. Tighten against the insert, never against the molded plastics surface.

High impact materials do not have as solid or as strong a grip on inserts as do other thermosetting materials. For this reason, avoid the use of small inserts in rag filled materials.

### Pipe Threads

Pipe threads are tapered to about 1¾° off their centerlines and consequently build up a considerable wedging effect when tightened. For this reason pipe threads molded into plastics material will crack or expand the molded piece very easily without much torque unless the molded section is extremely thick. Metal pipe thread inserts are necessary in nearly every case. Whenever possible, threading should be done before molding.

### Tapping of Inserts after Molding

If too much trouble is encountered in the effort to keep plastics material out of the threads during molding, the insert may be drilled to the tap drill size for the molding operation and the threads tapped in after molding. This allows a hole in the insert as a possible means

for holding the insert in place. If flashing occurs in the hole it will do no harm. Tapping will remove all flash as the threads are cut. The disadvantage of this method is that individual tapping is slower and more costly than tapping on the automatic screw machine when the insert is made originally.

In this manner tapping after molding is far better than re-tapping of a thread to remove flash because the thread is not enlarged.

### Thread Specifications on Inserts

A full depth of thread to the bottom of a tapped hole in an insert should never be specified. This, of course, applies only to the blind holes, not through holes. The reason is that a tap cannot cut a full thread to the bottom of a blind hole. A normal tap has three or four incomplete threads at the leading end in order to cut the thread progressively until it cuts to full thread depth. For this reason the tap drill should always run deeper than the required full length of thread by three or four threads in depth.

If the thread is cut instead of tapped a relief undercut should be cut in before threading to allow clearance for the end of the thread cutting tool. This clearance is also about three threads.

If the design does not permit this additional depth, a full thread can be run to about one thread from the bottom with repeated or progressive tapping operations. Progressive tapping is quite costly in production and should be avoided if possible.

Plastics material can be kept out of a thread where an insert must be open in the bottom by molding the insert in place with a blind hole threaded insert and then drilling out the end *after* molding.

### Wall Thicknesses of Inserts

The wall thickness between the major diameter of the thread and the bottom of the knurl grooves should be at least twice the depth of the thread for straight or cylindrical threads and at least three times the thread depth for pipe threads. Pipe threads require more wall thickness because of their "wedging" effect when tightened.

### Molded-In Rivets

Rivets in plastics parts should preferably be of the tubular rivet type rather than the solid rivet type. Tubular rivets require much less riveting pressure than solid rivets and have almost the same holding power from the standpoint of strength of the plastics material. Pressures required to work solid rivets usually break or split the molded part unless a sufficiently thick metal backing up plate is used. A solid rivet tends to swell from the impact and crack the molding, while a tubular rivet gives only at the end.

Rivets ordinarily are very successful as molded-in inserts. The only serious limitation is in finding a practical means for holding them in place for molding.

### Holding Plates to Surface

Flat metal plates can be held to the surface of molded parts by placing the plates in the molds and molding to the plates. This is practical if done properly. There are several methods of holding. Any good anchoring means is sufficient but such plates must be well anchored. Surface bond from the molding operation will never hold. Sometimes a bond of thermosetting cements is practical ("Cycleweld" developed by Chrysler Corporation, or "Reanite" produced by U. S. Stoneware Co.) but these are often costly and are done after molding.

A good anchoring means for a plate is to bend a section of the plate down so that it is molded into the material. A 180° bend or "U" actually hooks itself into the body of the material.

A hole or edge which is countersunk on the outside surface will permit the molding material to flow into the countersunk area. This is bad practice as an anchoring means because of the undesirable flow characteristics of the material. The first material that enters moves through the hole and against the opposite face in a stream the size and

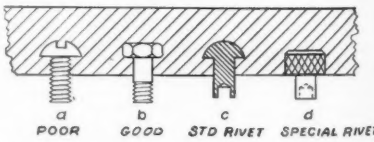



**Fig. 11—Standard screw head slots are not sufficient holding means to prevent rotation of the screw in the molded part. Hex heads are better. Rivets can often be molded in.**

shape of the smallest opening of the hole. Then it is deflected in its flow and fills out the chamfered area last by back pressure as it flows against its own incoming stream. A poor weld exists in a line along the surface of the incoming stream. This weakness makes it possible for the plate to be stripped off easily.

It is good practice to totally embed a portion of the plate in the molded material, with punched holes through the embedded section acting as an additional holding means.

Round punched holes are good for all practical purposes for holding. Odd shaped holes, while effective, are expensive to produce. It may be possible where a molding shop has access to the strip scrap of light stampings to utilize such scrap, particularly from small progressive die work.

Some molded-in strips or plates which extend from the surface of the molded part are difficult to seal off against flash if the dimensions are not held reasonably close.

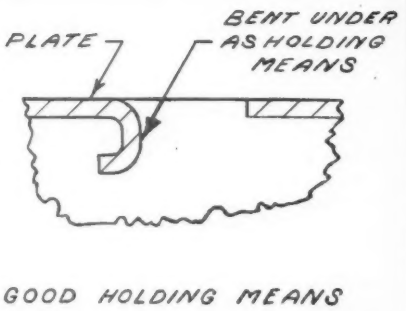



**Fig. 12—A flat plate or thin metal bar can sometimes be anchored into a molded material by bending such plate ends so that they will be well embedded in the material. The forming must be such as to assure that axial force alone cannot easily dislodge the plate.**

### High Torque Inserts

Inserts for high torque service must be designed properly otherwise inserts will break out of or split the molded part.

A hexagonal insert, for example, is satisfactory for service where normal torques are met but they will crack the molded part under excessive torque loads. As the hex tries to rotate in the part the leading edges of the hex create a wedging effect relative to its direction of rotation in a manner similar to the action of a hex nut in forcing apart the jaws of a pair of pliers when the grip to hold and turn is not sufficient. The torque action throws the material into tensile stresses exerted outwardly from the insert. Tensile stresses are the weakest mechanical property of molded plastics.

The same general effect is obtained with knurled inserts. This is particularly true if the knurl is deep enough to resist shearing and the wall section around the insert is not thick enough to withstand tensile stresses set up by the wedging effect of rotation.

It is obvious that knurled inserts may fail or loosen in the molded part either by shearing or stripping the plastics material which holds it or by spreading the material and cracking the adjacent walls. This illustrates the importance of a coarse deep knurl and a sufficiently thick wall section of molded material around the insert.

The spreading effect can be entirely eliminated and the shearing strength brought up to a maximum by using a high torque insert. Such an insert may be made from an extruded metal bar stock shaped so that the projections or external surfaces of the insert are *perpendicular* to the direction of rotation and the connecting surfaces are circular in the line of rotation. Slight radii are advisable at the outer corners to reduce stress concentrations in the plastics material. A grooved circular undercut can be added to increase axial or pulling-out movement.

### Testing of Molded Inserts

The most common types of testing of inserts are for torque, pull or axial strength, vibration and pressure leakage. Ordinarily these same tests are repeated over a wide range of temperatures. Tests for effects of immersion in liquids and for electrical properties are made when the molded product must meet such conditions in service. Each type of test should be carried repeatedly to the point of failure to determine the margin of safety or "safety factor". The point of failure should be well above the service requirements when plastics

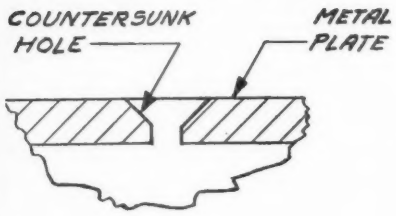



**Fig. 13—A countersunk hole or edge offers a poor holding means for a metal plate or any other material that is assembled to a molded plastics material. The turbulence of flow of molded material up the channel of the hole and reversing on itself creates a weak molded area due to the weld marks.**

are involved because of the wide variation in molding conditions and of materials at the time of molding. Points of lowest failure for torque, pull and pressure should be at least double their expected service requirements.

### Stopping Pressure Leakage Around Inserts

Fluid leakage along the contact surfaces between an insert and a plastics material is common with knurled surfaces and other surfaces with sharp inside corners. The principal cause is the failure of the molding material to fill out into the sharp corners due to the stiffness of the material.

This condition can usually be corrected or prevented in one or more of several ways. If the trouble cannot be corrected by increasing the molding pressure, varying the temperature of the molding material or by using a "softer" flow material or other change in the molding technique, the design of the insert will have to be altered by making one or more of the following changes:

(1) Keep the knurled section of the insert below the outer surface of the plastic. Keep it at least $\frac{1}{16}$" away and allow only a cylindrical or smooth section of the insert to come to the surface. This breaks the path of the leakage.

(2) Make an annular undercut on the insert near the surface of the molded part, with a fairly sharp outside edge. The plastics material will flow against this edge and seal off the leakage.

(3) With the undercut, as in (2), place a soft or resilient material in the groove to fill out and seal under pressure. Even a small rubber band in such a groove will stop leaks entirely.

Leaks around the outside of an insert are more apt to occur at high temperatures than low since plastics materials expand several times more than metals with rise in temperature. If the plastics material is on the inside of an insert the leakage will be worse at low temperatures because of contraction.

Many pressure leaks originate during the cooling of the molded part and are caused by uneven thermal rates of contraction (coefficients of thermal expansion) along the surfaces between plastics material and metal. For this reason it is best to select metals with the highest thermal expansion rates in order to approach the rate of movement in the plastics. This happens to be contrary to common belief.

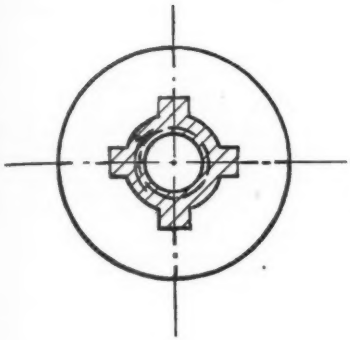
### Problems with Long or Large Inserts

When long bar or rod inserts are used they must be designed with due consideration of the temperature movements. For example, a metal bar insert four inches long will expand and contract eight times as much as a similar bar half an inch long. Stresses develop and the result is cracking or warping of the molded part. In such cases molding material of low mold shrinkage should be chosen. Physical property charts should be consulted for this data.

Many thermoplastics materials will shrink in time due to evaporation of part of the plasticizer from the material. The plastics material in some automotive steering wheels tended to shrink, and as the circular rod insert in the wheel did not change in dimension the plastics material cracked apart in several places. This condition can often be improved by using molding materials with camphor added as a plasticizer to retard evaporation of the other plasticizers.

### Use of Solder

Soldering of inserts, or for mold parts, is generally a very poor practice. Solder is too soft and its bond with metals too weak to withstand molding forces. In addition the high temperatures incident to molding will often melt the solder.



HIGH TORQUE INSERT

**Fig. 14—When a maximum torque resistant strength is required a special high torque insert, as illustrated, is used. This type of insert can be made from an extruded metal bar stock shaped so that the projections are perpendicular to the direction of rotation. Slight radii on the outer corners of the projections are advisable to reduce stress concentrations in the molded material.**

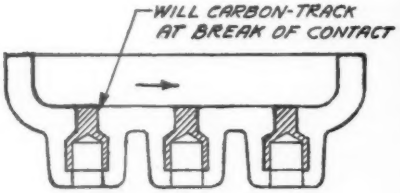
### Degreasing of Inserts

Metal inserts should be carefully "degreased" in a solvent bath to remove machine oil, lubricants or packing greases before use. If this is not done the insert will be poorly held in the molded piece and pressure leakage can be expected. Degreasing is always important if inserts are to be plated.

### Electrical Inserts

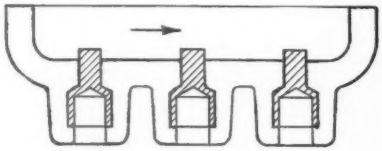
Some plastics possess good dielectric properties, that is, they are nonconductors of electricity. Bars, strips and other metallic parts molded as inserts in plastics of this type serve as conductors. From the standpoint of design such inserts must be considered as any other insert but with a few additional considerations.

Inserts for make-and-break contact, either for occasional or continuous service, should have their contact faces projecting *above* the surface of the molded part so that the contact breaks apart in air rather than at the surface of the molded plastic to prevent carbon tracking. Common examples of this type of design are automotive distributor caps and motor commutators.




POOR DESIGN

**Fig. 15—Inserts for make-and-break contact should have their contact elements projecting above the surface of the molded part, as in "b". In the design shown as "a" with the contact surface flush with the molded part a wiping contact will cause arcing at the break of contact. This will progressively carbon track the surface between the contact faces and eventually short circuit. Small radii on the contact faces will reduce arcing.**



GOOD DESIGN FOR SWEEP-TYPE ELECTRICAL CONTACTS

### Carbon Tracking

An electric arc always occurs when two conductors are separated in breaking an electrical contact. The higher the voltage the farther the arc will jump. Arcing builds up an instantaneous heat which, by repetition, can burn or char the surface of any plastics material. Nearly all molded plastics are made from organic compounds containing carbon, hydrogen and oxygen. The heat of the arc liberates the hydrogen and the oxygen and leaves carbon as a residue. This phenomenon of depositing carbon residue is called "carbon tracking".

## Contest on Estimating Plastics Molds

**The closing date of the contest on estimating the Six Cavity Stripper Plate Injection Mold (published on pages 122 and 123 of the January issue) has been extended to April 1 to permit more estimators, die and mold designers and other interested persons to submit estimates. A number of contestants have asked for back issues of TOOL & DIE JOURNAL which we regret we cannot furnish. We are however making a reprint of Mr. Thayer's series so that contestants may use the full set of tables of time values in making their contest estimate. Copies will be sent shortly to those who have already asked for them and to those who will ask for a copy.**

**One executive of an aircraft accessory manufacturer writes, "Your contest on mold estimating has given me an idea that it might be well for each of my lead off men to try their hand at it. I am, therefore, having drawing and bill of material enlarged and distributed. I would like to purchase six copies of the reprint 'Estimating Plastic Molds' to give the men something to work from. It is my belief that it will bring the necessity for meeting time estimates home to the men if they figure a job themselves." Other requests for a number of reprints have come from tool and die shops, custom molders and from metal working plants that are actively interested in plastics.**

**Several other contestants have called to our attention the fact that Mr. Thayer has not published a table of time value on hobbing. Mr. Thayer states that he has not prepared such a table so we are pleased to announce a special prize of ten dollars ($10.00) for such a table. This table should be based on actual shop practice and the values should be average values for an average shop. All other tables are based on such average values. Deductions or additions can be scaled subsequently by an estimator from the average figures.**

**Estimates postmarked on or before March 31 will be eligible for prizes. First prize is a $25.00 War Bond, second prize $10.00 in War Stamps, third prize $5.00 in War Stamps.**

### Design of Inserts

If electrical inserts with contact faces or points flush with the molded piece utilize, for example, a wiping contact across the molded part surface, the arcing at the break of contact will carbonize or carbon track the mold surface. This residue is pure carbon and pure carbon is a conductor of electricity. The track will lengthen until it extends between the two contacts. When this happens a short circuit is the result. High voltage arcing without any make-and-break contact also may cause carbon tracking. The presence of moisture and foreign material aggravate carbon tracking. Mineral filled materials have much better resistance to carbon tracking than cellulose filled materials.

Sharp corners on metal high voltage electrical parts allow voltage leakage as well as very easy arcing. For example, if two metal inserts fairly close to one another have sharp corners or contiguous sides, arcing will take place at a much lower voltage than if the corners were rounded. Voltage accumulates and concentrates at sharp corners and tips. Round corners will not allow easy accumulation of voltages. Instead, the arcing is retarded and the voltage builds up to a higher potential before it can arc. Sharp corners often allow leakage off into the air when the voltage is in the nature of static electricity as in an ignition system.

### Keeping Metal Away from Molded Surface

Molding pressure will, at times, force long bar or strip inserts against the wall of the mold in molding, which causes the metal to show up on the molded surface where it does not belong. If thermosetting molding materials are used the insert can be wrapped before molding with a strip of cloth, paper or other absorbent material impregnated with uncured resin of the same type. The cloth, paper, etc., comes to the surface instead of the metal in the molding process. The resin will make the insert wrapping cover practically indistinguishable from the molded piece surface and also insulate the metal from the surface.

***Mr. Prince's next article will begin a discussion of Threads.***

# APPLICATIONS FOR MOLD DESIGN FOR HOT FORMED PHENOLIC LAMINATES

**by Bruce Nash**
APPLICATION ENGINEERING,
Micarta Division
Westinghouse Electric & Manufacturing Co.
Trafford, Pa.

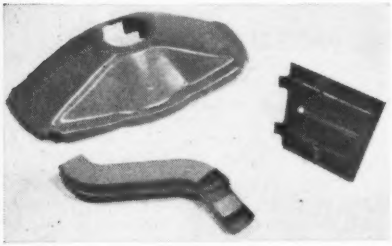
Although laminated plastics have been in industrial use for a number of years, it was not until recently that a new development, a hot formed laminate, made possible the processing of comparatively intricate shapes. At present, the material is being used exclusively for aircraft parts, such as shell ejector chutes, ammunition feeds, and as housing on various parts of the fuselage (Figs. 1 and 2). However, its lightness, noise deadening quality, high impact strength, and easy formability should make it attractive for industrial and commercial products that formerly were formed from sheet metal.

The postwar applications of the material depends on the economic factors involved and the physical properties required. Weight and high impact strength, for example, are of prime importance in aircraft design. The same properties are desirable on ships, automobiles, and railroad cars. On the other hand, in machine tool manufacture, lightness is a minor factor. In such an application, the acoustical properties of the material will probably be given more consideration. Many other products might well use its good insulating characteristics. Westinghouse Micarta is a heavy-duty thermosetting plastics material made from fabric or paper impregnated with synthetic resins and compressed by heat into a permanently solid substance with high structural and dielectric properties. Both molded and laminated types are made. Micarta "444" is a laminated type developed originally for the aircraft industry. It is processed in flat sheets of various thicknesses of cotton cloth impregnated with a phenolic resin binder. Micarta "444" maintains 60 percent of its tensile strength and gains 50 percent in impact strength at 170° F, the point at which the average thermoplastic begins to soften.

In hot forming phenolic laminated plastics, premolded flat sheets are heated to a predetermined temperature—ranging from 275° F to 500° F, depending on thickness—and immediately reshaped in a press. Since the molds may be constructed of wood, concrete, or Micarta in addition to metal, a great saving may be effected in tooling costs. Furthermore, no elaborate heating apparatus is required; the material can be brought

**Fig. 1—Hot forming laminated plastics are ideal for aircraft service because of their lightness and high impact strength.**

**Fig. 2—Other aircraft parts include a hopper, duct, and nameplate support.**



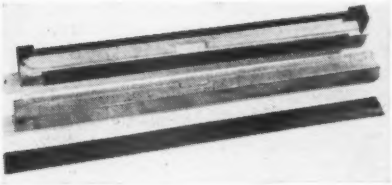


**Fig. 3—This compression forming die easily forms channels and angles with this material.**

up to forming temperatures either by infra-red lamps, ovens, oil baths, or hot plates. This choice of heating equipment makes the process available not only to the large manufacturer but to the small shop as well.

### Mold Design

A diversity of forming molds have been constructed; for the best adaptation of tools, it is desirable to fully evaluate all factors of design and application at the outset. Some of the more important factors which affect mold design are:

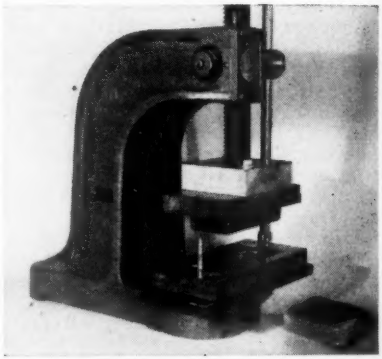
(1) *Shape and application*—for some shapes such as boxes there are many possible mold constructions. Complete specifications as regards functions, strength, and appearance are required.

(2) *Dimensions*

(a) Material thickness—as the thickness is increased more pressure is required in forming and the mold must of necessity be of sturdier construction, and generally is designed for power press operation. Manually operated bench molds are often used for forming simple bends when the material thickness does not exceed $\frac{3}{32}$". In deep drawing, the depth to which a part may be full drawn decreases with increasing material thickness.

(b) Radii—as the corner and bend radii increase less pressure is required in forming. In deep drawing, the depth to which a part may be full drawn increases with an increase in radii. For cylindrical cup shapes the depth of draw, h, is equal to $\frac{R^2-r^2}{2r}$, where the blank radius, R, is the limiting value and r is the cup radius. The index of formability, r/R, has been found to be from 0.67 to 0.77 for good hot drawing laminated phenolic sheet in thickness from $\frac{1}{32}$" to $\frac{1}{16}$".

**Fig. 4—An Atlas mandrel or arbor press is shown setup to form a thin part of relatively simple design.**



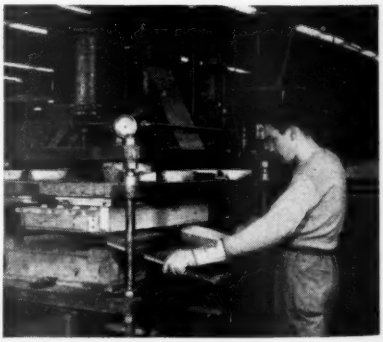


**Fig. 5—Large pieces as shown here or parts with a deep draw are formed on a hydraulically actuated compression press.**

(c) Other dimensions—Molds for parts with comparatively large overall dimensions are usually designed for power press operation. The depth of a shape such as a box will determine if the part may be full drawn or

(4) *Tolerances*—Simple shaped parts with a manufacturing tolerance of $\frac{1}{32}$" or greater are usually formed to the finished dimensions. The forming of more complex parts to size requires more liberal tolerances. Deep drawn shapes

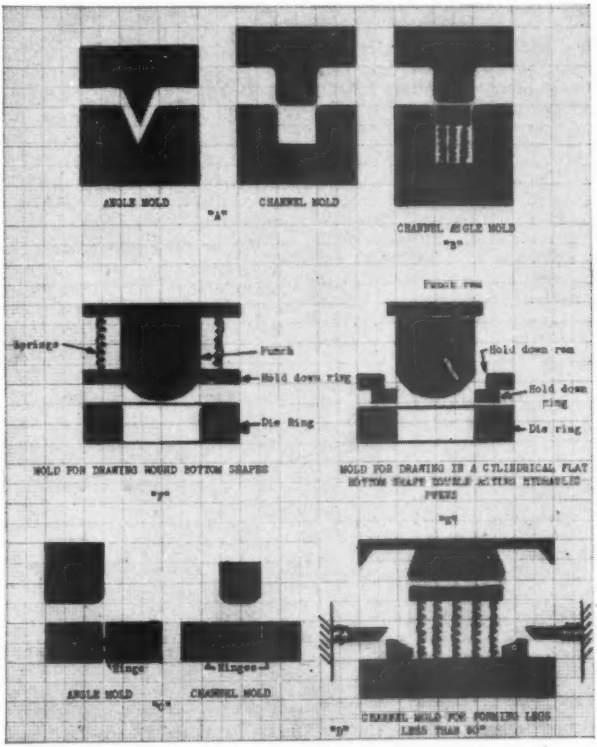



**Fig. 6—Various types of molds for hot formed laminates.**

whether it will be necessary to form the piece with open corners.

(3) *Holes, bosses, etc.*—Holes in the finished piece often may be drilled or punched in the blank prior to forming and used as locating devices for positioning the sheet in the press. Legs and pins may also be used.

Full drawn shapes with smooth contours are formed with a die ring as the female member of the mold. More complex contours, such as the box with bosses shown in Fig. 1, require a female counterpart of the male mold.

and complex pieces are usually fabricated after forming.

(5) *Quantity*—For small orders and sample pieces it is common practice to make the mold in the cheapest and quickest manner. Molds with only a male member and a device for wrapping the material around it (canvas and cloth are often used) are ideal for this purpose. Manually operated bench molds are often used for small and intermediary production. For large production quantities more durable molds are required.

(6) *Die Materials*—Hard wood is the

most common material used in construction of hot forming molds. It is easily worked and if the mold is not too complex will stand a fair number of pressings. However, repeated heating and cooling may cause the mold to warp and crack. For this reason wood molds are not generally suited for large scale production.

Molds made of laminated plastics are relatively cheap, easily worked, and very durable. Some have withstood 25,000 pressings and are still in operation. No failures have yet been reported. Such molds are well suited for large and small scale production.

Metal molds are extremely durable, and in addition can be water cooled, thus reducing the operating times. Since metal molds are expensive they are seldom used unless a large quantity of parts are to be produced.

Cast plastics, masonite and concrete are among other die materials that have been used.

Die materials having some resilience or "give" are the best suited for hot forming. In this manner an equalization of pressure is accomplished without high accuracy in die surfaces. In general, die clearances should be 10-15 percent in excess of the material thickness to be employed. Pressures ranging from 5-100 psi are required for reshaping depending on the thickness and complexity of the part.

Some of the basic mold designs for shaping simple bends and full drawn articles are shown in Fig. 6. Figs. A, B, C and D are four types commonly used in forming angles and channels. Molds of the type A are easy and cheap to make; the main disadvantage is that the blank to be formed easily shifts out of position when contacting the male member. Parts formed in this manner must be trimmed to size after forming. In molds similar to B, the spring activated floating section provides an excellent stripping device and prevents the blank from shifting during forming. In this way angles and channels may be formed to finished size. C illustrates a mold often used for making a small number of pieces. It is usually hand operated, inexpensive, and constructed so that the part may be formed to size.

Channels with leg angles less than 90° cannot be formed with molds of the A and B type unless modified similar to D. All four types can be modified to form shapes with 3 and 4 legs.

Deep drawn shapes such as cylindrical cups, round bottom shapes, and boxes are formed in molds of the type illustrated in E and F. Molds similar to E employ a double acting press and are costly. Its use should be limited to forming a great number of pieces or shapes of large dimensions. A spring pressure hold-down ring such as shown in F will give the same holding action as the double acting press and is much cheaper. For the maximum drawn depth of a given shape, the hold down pressure on the ring should be adjusted to the minimum required to prevent wrinkling.

While the best rule is to provide a hold-down ring for drawing, very satisfactory boxes have been full drawn without it. This is accomplished by adjusting die clearances to give the correct ironing action. Parts not subject to severe draw are often formed in this manner.

★

## Canadians Hold Plastics Conference

The Canadian Section, Society of the Plastics Industry, held their third annual Plastics Conference at the Mount Royal Hotel, Montreal, on February 6 and 7, attracting over four hundred members and guests. Among the important technical papers presented were: "Experiences of a Molder in Using Electronic Heat", by J. D. McDonald, McDonald Mfg. Co.; "Blow Molding of Thermoplastics", by James Bailey, Plax Corporation; "Plywood Structures", by R. D. Hiscocks; and "Residual Stress in Formed Methacrylate Sheets", by R. E. Richardson, Duplate Canada, Ltd. William T. Cruse, executive vice president of SPI, reviewed SPI activities.

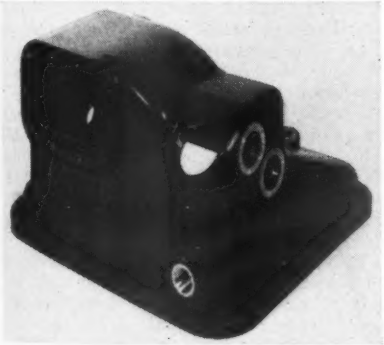
George Scribner, president of SPI and president of Boonton Molding Co., spoke at dinner the first day and Lt. Christopher Ellis, R. C. N. U. R. the second day. Lt. Ellis told the dramatic story of the contribution of the Canadian Navy to the United Nation's war effort. W. J. Connelly of Bakelite Corporation as luncheon speaker told of the wartime development of new materials and techniques.

# PLASTICS CASING

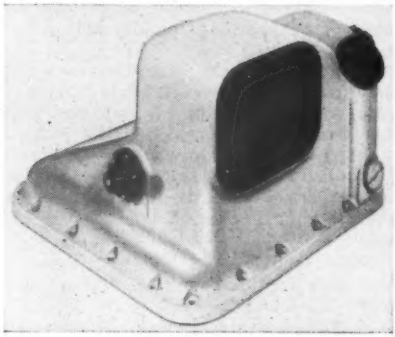
## FOR FIRE CONTROL INSTRUMENT

**by John W. Craig**
CHIEF INSTRUMENT ENGINEER
Manufacturing Division
The Crosley Corporation

One of the largest and most complex impact-resistant plastics moldings developed as a war material is the casing used as a cover for a fire control instrument manufactured by The Crosley Corporation for the Navy Department Bureau of Ordnance. Perhaps "cover" is not the exact description of this piece, as it carries the windows, light filter mechanism and external controls for the operation of internal parts, but for the purposes of this article, the term "cover" will be amply descriptive.



**Plastic upper casing for fire control instrument as received from the vendor by the Crosley Corporation, manufacturer of instruments for the U. S. Navy Department.**



**View of plastic upper casing for fire control instrument manufactured by the Crosley Corporation for the U. S. Navy Department, after painting, showing windows and exterior controls in place.**

As originally manufactured, this instrument had a cover of cast aluminum. Before the war had been in progress very long, however, the critical shortage of aluminum necessitated a complete redesign of this part. It was so simplified and streamlined as to greatly increase the field of vision of the operator over and around the instrument. This simplification made practical the use of a phenolic plastic material which, in addition to the savings in critical material, has at least three advantages. First, the plastics cover can be held to such dimensional accuracy that it is not necessary to do any machining before the part is used in assembly. The only work that is done is the drilling and tapping of the holes around the windows and the two brass inserts in the upper corner. The other two brass inserts are tapped before they are put into the mold, and the large tapped hole on the back of the cover is molded directly. All this work is done at the vendor's plant, so the only

operation performed on the part by Crosley, from the time it enters the plant until it is used in assembly, is painting. This painting, of course, is only for appearance's sake, since the plastic itself is entirely resistant to corrosion.

Secondly, the cast aluminum was such a good conductor of heat that it had been necessary to line the inside surface of the cover with a felt-base insulation material held in place with thin aluminum retaining plates. The use of plastics material having a much lower rate of thermal conductivity eliminates the necessity for the insulating material and retainers, and results in a considerable saving in material and assembly time. The performance of the instrument is actually improved, as the temperature within is more uniform with the plastics cover in use than it was with the aluminum cover plus the extra insulation.

Third, and last, the plastics material used was formulated especially to meet Navy specification 17P4, TYPE CFI-40. It is a high strength molding material having impact strength far in excess of that usually associated with molding compounds. This strength is due to the fibrous filler, which is a mass of short lengths of cotton and rayon cords, similar to the cord used in the manufacture of automobile tires. The use of this material in sufficient quantity to give a molding specific gravity of 1.35 results in a flexural strength of 12,000 to 13,000 psi and an impact strength of 6.4 to 8.0 foot-pounds per inch of notch.

The material is first formed into a preform slug about 8" in diameter and 3" thick. This is then preheated electronically, so as to improve the flow quality when it is put into the mold and also to cut down the time of heating in the mold. Since the mold is of single cavity type, any speeding of the molding cycle is very important in increasing production. The use of this preheated material enables the heating time in the mold to be cut down from 6 minutes to about 4 minutes. The heat is then turned off and the piece is allowed to cool for about 4 minutes. The piece is then removed from the mold and allowed to continue to cool on a fixture so designed as to hold all the important dimensions. Since the piece has a heavy cross section, this care in cooling is very essential. This can be seen from the fact that the tolerance on many of the dimensions is within .005". The mold is operated in a 500-ton press at a temperature of from 325° F to 350° F. The entire time cycle from the time one case is removed until the next case is removed is about 12-15 minutes, which is a very rapid cycle, considering the size of the part. The finished piece is 12" wide by 11" long by 8" high and weighs 4½ lbs.

On the basis of the results obtained from the use of this material it is very probable that it will find a much greater acceptability after the war. The manufacturers of the molding material as well as the molders, have gained valuable experience in the handling and processing of this material. As a result of this experience we may expect that high impact resistant plastics will compete actively in a market that at one time consisted only of metals and their alloys.

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## New Plastic Adapted for Electrical Insulation

Polythene, a new plastic manufactured by the polymerization of ethylene under extremely high pressures, is now being used for cable and wire insulation by the armed forces. Its original development took place in the laboratories of Imperial Chemical Industries, Ltd., in England, and it has since been developed and improved by duPont.

The following are some of the outstanding properties of Polythene: flexibility and toughness over a wide range of temperatures; good resistance to water and to penetration of moisture; chemical inertness; excellent electrical properties; and specific gravity of 0.92-0.93. In thin sections it can be classified as non-rigid, although it is not limp or rubbery, and in thick sections it has enough stiffness to be rated among the more rigid plastics.

Polythene can be molded in standard commercial machines by injection or compression methods, or extruded to form sheets, films, fibers, and tubes. It is of crystalline structure and can be made in translucent and opaque colors. Coatings of Polythene are applied by flame-spraying upon metals, wood, glass, plastics, and even paper.

*INFORM-A-GRAM KEY No. 859-V*

## Industrial Plastics

The response to our invitation to Tool & Die Journal readers to participate in the development of "Industrial Plastics" has been very gratifying. We thank many of our old friends and loyal readers for their expressed interest and encouragement. We also thank those outside our readership whose interest and evidences of support have come to us.

Plans are now well advanced for the initial issue. A number of outstanding articles have been scheduled. A nationally known plastics engineer will described the equipment layout of a plastics tooling department, an experienced mold engineer will show a working drawing of a loading fixture for multiple cavity compression molding, a designer with a background of mold design outlines design principles for products to be made of thermosetting materials, and the head of the plastics department of a company holding extremely important aviation equipment contracts will discuss the role of threads in parts design. Other practical and important material has been prepared for the first and succeeding issues.

A number of departments will be carried. In more than one instance, technical men of established reputations in the plastics and allied industries will contribute and act in an advisory capacity. The emphasis throughout the publication will be on directly useful material for the designer, the mold and tooling builder, the custom molder, the material manufacturer and supplier, and all organizations that render a specialized service to the plastics industry.

The distribution of "Industrial Plastics" will be on the basis of CBI—Cycle of Buying Influence—the same plan on which Tool & Die Journal goes to the precision metal working industries. A very restricted number of subscriptions will be accepted contingent upon a limited paper supply. We will make every effort to send a copy of the first issue to those who specifically request it.

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## Plastics Club Elects Officers

The Plastics Club of the United States, a group of greater New Yorkers who are retail merchandisers of plastics products, have elected their 1945 officers as follows: John Sorg of Sorg Paper Co., president; Charles Gates, B. Altman Co., vice president; and J. Murray Beveridge, Mavco Sales, vice president. At the same time, Ephraim Freedman, R. H. Macy & Co., was elected to the Board of Advisors. The Club holds regular meetings at which leading men in the plastics industry are heard.

★

## New Chemical Department Announced by GE

The directors of General Electric Co. announce the formation of a new Chemical Department under the general managership of Dr. Zay Jeffries. Dr. Jeffries was moved from his position as technical director of the company's lamp department and elected a vice president of the company. E. L. Feininger of Schenectady and William L. Milton, Jr., of Pittsfield were named assistant general managers. Feininger will remain in charge of the Resin and Insulation Materials Division and Milton of the Plastics division. At the same time, Don S. McKenzie was named general sales manager, Robert L. Gibson was appointed advertising and sales promotion manager and Harold P. Smith was named auditor.

The new department will supervise the operation of the resin and insulating materials division and the plastics divison of the appliance and merchandise department.

★

## Du Pont Chemist Wins Perkins Medal

Dr. Elmer K. Bolton, chemical director of E. I. du Pont de Nemours & Co., was awarded the Perkins Medal at a meeting of the American Section of the Society of the Chemical Industry in January. Awarded annually, the Perkins Medal went to Dr. Bolton for outstanding achievements in the field of industrial research. In his speech of acceptance, Dr. Bolton pointed out that in 1942 almost half of the du Pont business consisted of products that did not exist in 1928 or that were not in commercial manufacture. The new Perkins medalist was a leader in the development of neoprene and in nylon research.

## Wood Pulp Used in Smokeless Powder

A new process has been perfected to manufacture smokeless powder from the same low cost wood pulp used in kraft wrapping paper and bags. J. M. Olin, Vice President of Western Cartridge Company, announced recently, with War Department permission, that the new sulphate process to purify kraft pulp climaxes ten years of research by Western Cartridge Company.

The new process, Olin said, relieves America of much of its dependence upon cotton linters for the production of nitrocellulose, base material of rifle and cannon powder.

Research into the new process has been carried on by Dr. Fred Olsen, internationally known explosives expert, who is research director of Western Cartridge Company, and experimental lots of kraft pulp, produced by the company's sulphate process in the plant of the Gaylord Container Corporation at Bogalusa, La., have been successfully nitrated and manufactured into smokeless powder in the government plants at Radford, Va., and Charlestown, Ind.

Wood has formerly been used in the production of nitrocellulose, but the new sulphate process permits the use of woods of a lower grade and faster growing type than are now usable in the older sulphate process.

The significant difference between the two processes, Dr. Olsen states, is that sulphite pulp is produced by treating wood chips with acids, whereas, sulphate pulp is produced by treating wood chips with alkalis. Southern pine, one of the most plentiful species of trees used in the manufacture of wrapping paper and bags, yields readily to the new sulphate nitrocellulose process. The excess of pitch and turpentine in the Southern pine makes it difficult to purify by the sulphite process.

"The new sulphate process opens a vast source of raw material for the production of smokeless powder in the event that there should be a further restriction of supplies of cotton linters, or of sulphite pulp", Dr. Olsen said. "Experiments at East Alton also indicate that the sulphate process is less expensive than any now in use."

## Measurement of Giant Molecules

Two revolutionary instruments have been installed in the Highpolymer Laboratory of the Polytechnic Institute of Brooklyn. These instruments for the first time make it possible to determine the shape of a molecule by sight, and thus shorten the time required in determining the weight of its polymer molecules. The two instruments depend on the scattering of light.

The fact that light can be scattered by molecules has been known for decades. Einstein explained it mathematically in 1910. In 1943 the Nobel Prize winner, Dr. Peter Debye of Cornell, showed how the principle could be used to compute the molecular weight and shape of giant molecules, which is just what the practical chemist wanted.

At present, chemists rely on viscosity, or the rate of flow, to foresee the fundamental properties that a polymerized substance will have.

The new instruments, which are now being used at Polytechnic Institute on two Army projects involving coatings and films, were designed by Dr. Paul M. Doty, research associate and instructor in physical chemistry at the institute, and Dr. Herman F. Mark, a noted authority on high polymers, in accordance with Debye's principle for computing molecular weight and shape of giant molecules. The instrument makes it possible to measure light as it is scattered by a solution, and provides a standard method of producing fibers that will wear well, plastics that will be strong, rubbers that will have a high resistance to abrasion.

Since the technology of plastics has now outstripped advances in fundamental knowledge of polymer chemistry, the Polytechnic Institute has organized a separate division of high polymer chemistry, the first of its kind.

★

The American Cyanamid Company has announced the appointment of William C. Davis as Product Service Manager for all copolymer type plastics produced by the company. The resignation of Richard H. Malamphy, who had been in charge of the sale and servicing of Laminac resins, was also announced.

(CONTINUED FROM PAGE 115)

out two of their foremen to supervise the work. The men at Crile receive the same benefits and are subject to the same deductions as the plant employees. There is no set amount of work that the men must do but they are not allowed to work more than three hours per day.

The cooperation of industry has been excellent, and several companies are now determining whether there are any operations in their manufacturing setup that can be handled by the Crile veterans.

The Reliance Electric and Engineering Company of Cleveland is the second manufacturer to become active in the movement and their work will soon be under way.

**Although no veteran can work more than three hours per day standard time keeping practices are employed.**

*Crile Staff Photo*

Several other activities have been initiated with the purpose of demonstrating to the men that they are of real value to themselves and society. These activities include elementary watchmaking and repair. This type of work helps the men steady their nerves and gives them an idea of what it is like in case they are interested in following the trade upon their return to civilian life. This class is sponsored by the 24kt Club in cooperation with the Watchmakers Club of Cleveland.

The Sherwin-Williams Company is conducting a sign painting and silk screen process class.

Under the supervision of experienced men who are patients at Crile, Capt. Goldenberg is conducting classes in woodworking, metalcraft, printing, hand-loom weaving and plastics working.

The plastics work consists of the making of plastics novelties that the men send home or give to their friends in the hospital. This work is entirely that of sawing and filing as such motions are most beneficial to those arms that have been injured, either left or right or both, depending on the needed exercise. The material for this work is all donated because Crile Hospital has no priority for plastics.

At the present writing there is no material on hand so the plastics work has stopped until receipt of another donation of scrap material from some manufacturer. There is a great need for about 500 pounds of suitable plastics scrap a week in this excellent physical rehabilitation work.

The men are responding with everything they have because they recognize an opportunity to aid their own recovery and, above all, because they are thus able to help their buddies who are still on the battle fronts by adding to the war production.

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## How Did You Do?

**(Solution to TDJ's January Crossword, Page 133.)**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 M | 2 E | 3 T | 4 A | 5 L | ■ | 6 P | 7 L | 8 A | 9 N | 10 E | 11 D |
| 12 C | O | O | L | E | 13 Y | ■ | 14 A | C | I | D | S |
| K | ■ | 15 P | L | A | I | N | T | ■ | C | ■ | C |
| 16 I | 17 N | ■ | 18 O | D | E | ■ | 19 H | 20 I | K | E | ■ |
| 21 N | A | V | Y | ■ | L | ■ | 22 E | R | E | ■ | 23 B |
| 24 N | I | ■ | ■ | ■ | D | ■ | 25 S | E | D | 26 G | E |
| 27 E | L | 28 E | 29 C | 30 T | ■ | 31 C | ■ | ■ | ■ | 32 A | S |
| Y | ■ | 33 T | I | E | ■ | E | ■ | 34 A | I | R | S |
| ■ | 35 I | C | O | N | ■ | 36 R | 37 P | M | ■ | 38 Y | E |
| 39 P | ■ | H | ■ | 40 D | E | R | A | I | 41 L | ■ | M |
| 42 S | 43 I | E | 44 G | E | ■ | 45 O | R | N | A | 46 T | E |
| 47 I | N | S | E | R | T | ■ | 48 T | O | P | E | R |

# NAVY DEPARTMENT PRESENTS 25

## INVENTIVE PROBLEMS

The Navy Department is seeking solutions to a great variety of technical problems. Inasmuch as these problems involve the application of inventive talent, the subjects and specifications have been turned over to the National Inventors Council which is under the chairmanship of C. F. Kettering.

Tool & Die Journal readers having any suggestions toward solutions of these problems are invited to send them to the

National Inventors Council
Department of Commerce
Washington, D. C.

for consideration and report. Suggested solutions should be prepared in sketch and description form.

The twenty-five problems and their specifications, applications and characteristics are as follows:

**A SATISFACTORY SHOCK-PROOF AERIAL DELIVERY CONTAINER** not requiring a parachute; possibly pneumatic cushioned, the cushions to be inflated from a $CO_2$ bottle after leaving the plane. Inexpensive enough to warrant its being classed as expendable after being used once.

**DEVICE FOR TRANSMITTING ROTARY MOTION THROUGH A MOISTURE-PROOF BARRIER.**

Applications: Shafts for control knobs on radio equipment provided with immersion-proof case; generator shaft for field telephones equipped with immersion-proof cases; generator shafts for hand-cranked power supplies for field radio equipment.

Characteristics: Should prevent entrance of water or moisture vapor when immersed to a depth of ten feet; should offer a minimum of frictional opposition to rotary motion; should be small in relation to the equipment to which applied; should have ample power transmission capability; should be applicable to existing equipment with a minimum of modification.

**A BEACH MARKER LIGHT,** to be visible from 5000 yards out to sea with rechargeable or non-deteriorating battery. Not in excess of 5 pounds weight. Effective burning time; 70 hours continuous use, or 7 days of 12 hours on—12 hours off—use.

**A DURABLE PLASTIC-IMPREGNATED FABRIC,** waterproof, lightproof, weighing less than 6 ounces per square foot. Suitable for tentage.

**WATERPROOF JACK:**

Applications: Microphone, headphone, and key jacks for telephone equipment.

Characteristics: Should prevent water or moisture vapor from penetrating equipment, even when immersed to a depth of ten feet; should be capable of cleaning and drying without tools; should accommodate standard plugs.

**A GASOLINE RESISTANT COATING** for the interior of gasoline drums and not adversely affected by gasoline.

**DIRECTIONAL-DRUM LENS:** The Coast Guard uses a large quantity of 200 mm, fresnel type drum lenses on lighted aids to navigation. These lenses provide a 360° fan beam of uniform candlepower about the horizon. In many instances the candlepower in a specific direction should be considerably higher than that of the uniform beam. Present practice in such cases is to install an auxiliary "spot" light to increase the intensity in the specific direction.

A need exists for a single lens which will permit the function of both of the above lights to be accomplished from a single light source. The lens should have the overall dimensions of the present 200 mm drum lens to permit its being used in the existing housings.

**A CONTINUOUS SAMPLING COMBUSTIBLE GAS INDICATOR** with automatic alarm which is simple, positive, inexpensive and suitable for installation in gasoline-driven motor boats for continuous sampling of the vapor in the bilges.

**A SMALL PORTABLE FIELD STRENGTH METER** about the size and weight of a walkie-talkie for rapid checking of radio field intensities in the vicinity of radio transmitting stations. The instrument must be simple to use and accurate within plus or minus 10%. Frequency range desired is 100 KC to 20,000 KC. The range of field intensities desired is from 10 to 1,000 millivolts per meter.

**RADIO ANTENNAS** up to 300 feet in height that can be set up by unskilled ground crews. The efficiency of radio devices is

*(TO PAGE 142—PLEASE)*

# RELATIONSHIP BETWEEN HARDENABILITY AND PERCENTAGE OF MARTENSITE IN SOME LOW ALLOY STEELS*

**J. M. Hodge****
**and**
**M. H. Orehoski**

The criterion of hardenability which is at present most widely accepted and used is based on a microstructure of 50 percent martensite, although optimum properties in conventionally quenched and tempered steels will be obtained when the microstructure before tempering is fully martensitic. With low hardenability steels the differences between hardenability on the basis of 50 percent martensite and that on the basis of full martensite will not be large, but with steels of higher hardenability these differences may be considerable. The purpose of the work reported in this paper was to evaluate the relationship between hardenability on the 50 percent martensite basis and that based on higher percentages of martensite in low alloy steels.

The method used was metallographic examination of Jominy tests, measuring the distance along the Jominy bar to 99.9, 95, 90, 80 and 50 percent martensite microstructure, converting these distance values to hardenability values in terms of ideal diameter and comparing the values at 50 percent martensite with those for the higher percentages of martensite. In addition, the hardness values corresponding to the various microstructures were noted and plotted against carbon content. This was done for thirty-five steels over a range of .15 to .79% carbon. The following types of composition were included:

1. Plain carbon
2. NE 1300
3. NE 8600
4. NE 9400
5. SAE 4100
6. SAE 4300
7. SAE 4800
8. SAE 4600

It was found that in these steels the full martensite hardenability varied from 80 percent of the 50 percent martensite hardenability at an ideal diameter of 1" on the 50 percent basis to 45 percent of this value at an ideal diameter of 7" on the 50 percent basis.

The hardness values of the 99.9% martensite structure were found to vary in a fairly uniform manner with carbon content as follows:

| | |
|---|---|
| .20C | 44 Rc. |
| .30C | 50 Rc. |
| .40C | 56Rc. |
| .50C | 60 Rc. |

Curves correlating hardenability on the 50 percent basis with that on the basis of 99.9, 95, 90 and 80 percent martensite, curves correlating calculated hardenability on the 50 percent basis with that on the 99.9, 95, 90 and 80 percent martensite basis and curves correlating the hardness of the 99.9, 95, 90, 80 and 50 percent martensite microstructure with carbon content are presented.

*Condensation of a paper presented before the annual meeting of the American Institute of Mining and Metallurgical Engineers, New York City, February 19-22, 1945.*

**Development Engineer and Metallurgist, Duquesne Works, Carnegie-Illinois Steel Corporation, United States Steel Corporation Subsidiary.*

## Compressed Air Speeds

*(CONTINUED FROM PAGE 106)*

The operation is completed in three seconds. It would require five minutes if he were to drive down the screw by hand methods.

The disc-type airplane brake made by National Acme is shown in Fig. 8. The worker in the picture is testing the brakes for leaks by applying compressed air through the bleeder hole. First, he opens the bleeder hole. Then air pressure is applied to drive out fluid from the brake, thus demonstrating the bleeder is clear. Next, the hole is closed and air pressure is again applied. If fluid were to come out in the second test, it would reveal that the brake is leaking. The tester is able to get his information the second after air pressure is applied in each test.

The alternative to the compressed air method of testing would be hydrostatic tests at 600 pounds pressure, rather than the 100-pound air pressure. That not only would require equipment other than the available air pressure but the testing would take more time and would create an oily mess.

The compressed air needs of the airplane brake and wheel plant are supplied from an electric motor-driven air compressor of approximately 1000 cubic feet per minute capacity. The larger machine tool plant receives its compressed air from two compressors, each with the same output as the one of brake plant's. One of these three compressors is shown in Fig. 9.

The way compressed air has been put to work at National Acme, to save manpower and speed output, typifies the innumerable other ways manufacturers are finding to get out war production on time and in greater quantities.

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## Use of Carbides

*(CONTINUED FROM PAGE 100)*

Punch and die are located in a special machine by an adjustment in the die holder. An accurate setup is required and the punch is separately produced instead of being shear-centered. About 0.002 in. clearance is allowed between punch and die on a side. Dies for this work are generally used until they are so dull the punch will not shear a clear hole and will begin to tear the paper. Since the operation is done under water, die cases are made of stainless steel to prevent their rusting. At times, punches with carbide ends also have been used for this work. If this is done, however, it is essential that the alignment be extremely accurate and the dies well supported to prevent the possibility of breaking up the dies with the hard carbide punches. Die life for this type of work was approximately 20 times greater with carbide inserts than it was even with chrome plated tool steel dies.

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## Bordner Appointed District Manager

Lee Bordner, formerly of Milwaukee, has been appointed a district manager by the Chicago Molded Products Corporation. As one of three district managers, Bordner will supervise all engineering production and planning of the firm's accounts in South Chicago, Southern Illinois, Missouri, Michigan, Oklahoma, Texas, and the West Coast. Mr. Bordner has been active in both SPI and SPE and has written extensively for the technical papers.

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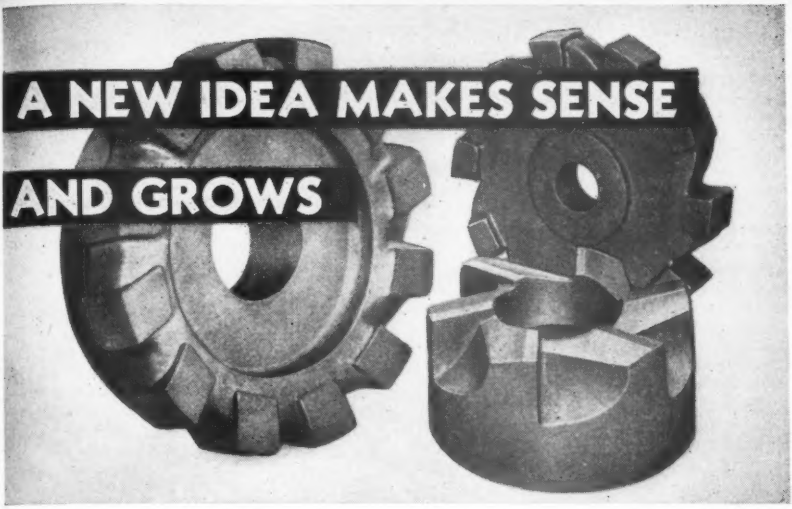
## Two New Navy Combat Films

Target Japan, a 12-minute action-filled motion picture, vividly portrays developments in the Pacific from the dark days of Pearl Harbor up through the step-by-step cracking of Japan's outer fortress. This film was produced by the Navy in cooperation with the March of Time and is available in both 16mm and 35mm.

Pacific Firepower (11 minutes, available only in 16mm) features the part played by aircraft in the conquest of the Marianas, portrays the engineering feat involved in the construction of the Saipan airstrip which brought Tokyo within easy bombing range, and describes the Navy's famous carrier-based Helldivers.

War plants desiring to exhibit these newest battle films may obtain them through their nearest depository of Navy incentive film. The name of the nearest Navy Dept. film distributor may be obtained by writing: Chief of Industrial Incentive Div., 2118 Massachusetts Ave., N. W., Washington 25, D. C. A nominal rental charge is made for the films.

# A NEW IDEA MAKES SENSE AND GROWS



TAKE the desirable qualities of steel . . . mix well with the most worthwhile characteristics of iron . . . and the result is simply a natural for cutting tools.

That is exactly what Cooper-Bessemer has accomplished in developing tools of cast Meehanite — first tool shanks and forming tools, now face mills, side mills and shell end mills of almost every size and type for working iron, steel, plastics and all non-ferrous metals. These tools have exceeded the most optimistic ideas of endurance, speed and economy . . . fully proved in Cooper-Bessemer's own engine-building shops and in hundreds of other shops equipped to do their own carbide tipping.

Space won't permit telling the whole story here, but engineers and metallurgists will agree to the basic soundness of this new idea — an idea that can quicken your cutting . . . simplify your procedures . . . and dwarf your costs.

Write for the complete facts, and while you're about it why not specify the size and type tools you need and get prices? Or, if you prefer, just describe your work in detail. Cooper-Bessemer is well prepared to give technical advice on speeds and feeds for all materials. No obligation.

All tools are available either right or left hand in a full range of designs for cutting iron, steel, plastics, and all non-ferrous metals. All tools are cast-to-shape minimizing machining.

**FACE MILLS** From 4 to 12 inches in diameter in 1" steps.

**SIDE MILLS** From 3 to 8 inches in diameter in 1" steps, and in several cutting widths. Far easier to machine than steel, they are readily used in combination as staggered tooth or slotting cutters.

**SHELL END MILLS** From 2 to 6 inches in diameter in ½" steps.

**TOOL SHANKS** Usual standard shapes. Special shapes produced on order.

**SPECIAL PURPOSE TOOLS** Forming tools and special tools of every description are regularly cast-to-shape.

THE **Cooper-Bessemer** CORPORATION
Industrial Tool Division
Dept. J, Mount Vernon, Ohio

TOOLS ARE WEAPONS — TREAT 'EM RIGHT

*(CONTINUED FROM PAGE 138)*

often limited by the extreme difficulty of obtaining reasonable antenna heights quickly in the field. Very light alloys and special rigs for rapid erection by a ground crew without climbing are desired, in addition to ability to dismantle or collapse into packages not exceeding 20 feet in length. Insulated base vertical antennas are preferable but grounded base type could be used if the device has enough other advantages in the way of ease of erection and ruggedness.

**A PORTABLE FIRE EXTINGUISHER** using liquid similar to the carbon tetrachloride (or Pyrene) type, suitable for use around electrical equipment which will not form phosgene or other toxic gas when used to extinguish fires, as in the case with the carbon tetrachloride extinguishers.

**PROOFING MATERIAL** which will make tentage and tarpaulin more resistant to the rapid rotting that now occurs in humid, tropical climates.

**A PRECISION TWIN-TRIODE VACUUM** tube with general characteristics of the current 6SN7 type having the following additional precision features:

1. After a fifteen-minute warm-up, the gm of the two sides shall be equal over the normal operating range to within + 1%.

2. The tube shall be completely non-microphonic.

3. The above characteristics to be maintained over an ambient temperature range + 80° C to —40° C.

4. It would be possible to produce this tube by mass production methods with not more than 10% rejects.

NOTE—Tubes presently available in production permit excessive variation in grid-plate conductance in the separate halves of the tube.

**CHEAP AND EFFECTIVE BARRIER** to prevent the propagation of cracks in steel structures, without making use of riveted seams and the caulking, etc., incidental thereto.

**SMALL AIRCRAFT TYPE DC MOTORS** without commutators, slip rings, or any other moving contact arrangements, so as to eliminate service difficulties with commutators and electrical noise produced thereby.

**A METHOD OF MEASURING THE ELASTIC STRESSES** locked up in steel or other metallic structures at and beneath the surface of the material without having to dissect the structure in order to record the elastic recovery which results from isolating various segments.

**SMALL HOOKE'S JOINT OR UNIVERSAL JOINT FOR INSTRUMENT USE,** the efficiency of which is sensibly constant with angularity of output shaft axis up to 10°. For above shaft axis angularity units, the Hooke's joint should have an angular velocity ratio of input to output shafts constant and equal to unity over the cycle with as high an efficiency as possible.

**A POLYPHASE AC INTEGRAL HP MOTOR** up to 50 HP, whose inrush current does not exceed the running current and whose starting torque equals the running torque.

**SINGLE UNIT RANGE LIGHT:** A single optical device which will indicate with a reasonable degree of sensitivity a vessel's lateral deviation from the centerline as it proceeds along a narrow channel. Such a device must be inexpensive and low in power consumption. The conventional aid to navigation for such purposes consists of two lights on the prolongation of the centerline separated some distance from each other with the rear light higher than the front. It is in the interests of economy, and also to provide against the fact that the terrain may make the installation of two lights impractical, that this device is needed. Economy involves current consumption and cost of structures. Existing 2-light ranges require approximately 50 KWH per year for a candlepower of 10,000 white.

**A METHOD OF WELDING LIGHT GAGE ALUMINUM.** (This is of particular interest since aluminum lifeboats and life rafts are currently of riveted construction due to the lack of a satisfactory method of welding.)

**SMALL, FAST-ACTING, DOUBLE-ACTION SOLENOID** to operate on 28 volts DC, with a stroke of about 0.5, with a 20-pound pull (or push) at condition of maximum air gap. The plunger should "seat" at each end of travel and would very probably have to be an electromagnet whose polarity would reverse at each end of travel.

**AN EXPENDABLE, COMPACT, LIGHTWEIGHT, RUGGED, MECHANICAL DEVICE** to permit successive closures of up to eight electrical circuits with a time interval between closures of about 0.2 to 0.3 seconds.

**"NON-SLIPPING" SHOE SOLE** which will give good footing on an oily, steel deck of a ship rolling as much as 17°. This shoe sole should be non-injurious to feet, non-sparking and reasonably long wearing.

**METHOD OF WELDING HIGH PRESSURE PIPING** without the aid of backing straps or with back straps which would be soluble in a harmless solution which could be introduced in the pipe before putting same into service.

**AN OIL OR LIQUID KNAPSACK SPRAYER** for use especially in malaria control work in overseas theaters, which, (a) is of simple construction, (b) has easily replaceable and reproducible parts, (c) has a minimum of rubber parts and gaskets, and (d) is light, rugged, durable and leakproof.

# ASM Offers Study of Enemy Metals

Germany is cramped for copper, nickel, molybdenum, vanadium, tungsten, chromium and manganese, in about that order, while Japan seems to have substantial stockpiles of alloying elements, according to a metallurgical survey of enemy material, prepared by J. R. Cady, H. W. Gillett and L. H. Grenell of Battelle Memorial Institute for the War Metallurgy Committee, and presented in a 32-page booklet by the American Society for Metals.

This report is based on studies of captured material to determine proper defense and to learn any useful kinks in design, methods of manufacture or materials used, that might be applicable to improving quality or increasing production of our own weapons. Economic aspects of these studies are also important as an enemy shift from one raw material to another, or from one method of production to another, may be very revealing as to his shortages in materials or production equipment.

Both the Germans and Japs have tended to make unimportant but irregularly shaped gun parts by hogging out from bar stock, when these parts could easily be stamped out from sheet and assembled by copper brazing or spot welding at a saving in man-hours, or where the part could be die-forged to reduce the amount of machining. Later German ordnance practice and designs seem to turn somewhat toward labor saving design, although small use is made of free machining steel.

Japanese practices generally show still less of an approach to quantity production methods; much hand work is indicated. German workmanship as to finish and dimensional tolerance is consistently good on munitions. Jap workmanship is consistently mediocre although generally adequate for the use intended.

The booklet is available free of charge, from American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

**At GE's Pittsfield Works, tool, cutter and flat gage profile angles are accurately checked against the protractor setting with the help of an easily improvised glass panel illuminated from behind.**

# CATALIN LIQUID RESINS

## *are Pouring into* PLASTIC TOOLS AND FIXTURES!

**New Casting Techniques Give Preparation and Production a Break!**

Pioneered by aircraft manufacturers, the use of Catalin Liquid Resins for constructing assembly line tools, molds and fixtures has developed from a wartime expedient into a "here-to-stay" industrial success!

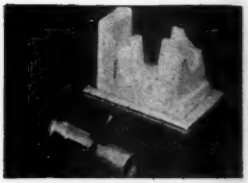
Carefully compiled records – report important savings in preparation time – reveal simplified forming procedures – point at superior results and to an accelerated rate of production.

The story behind Catalin Liquid Resins as applied to Plastic Tooling is a vitally important one. You should know all the facts . . . And since the advantages to be gained by their adoption are so far-reaching, the Catalin staff welcomes the opportunity to present the subject to you in detail. Inquiries invited.

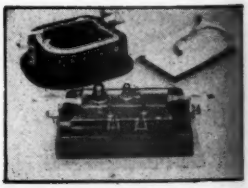
**CATALIN CORPORATION, 1 PARK AVE., NEW YORK 16, N. Y.**

LIQUID RESINS · CAST RESINS · MOLDING COMPOUNDS

A Catalin upper accessory panel fixture for PBM "Mariner". Originally designed to be cast from aluminum, 100 machining time hours were saved by the use here of Catalin.

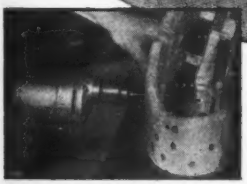


A Catalin checking fixture for a welded assembly shown beside the actual part from which it was molded.

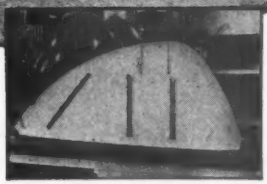


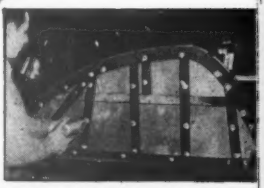
Top left: Catalin drill jig made in 35 hrs. by molding from the sample part with bushings attached; right: checking fixture made in 5 hrs.; bottom: an assembly fixture made in 20 hrs.

*Photographs, thru the courtesy of The Glenn L. Martin Co.*



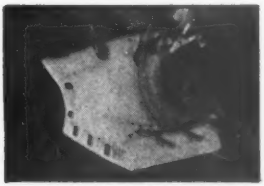
Drill jig cast from Catalin with bushings integrally cast in the jig. Time saved, 115 hrs. for each of eight jigs.





Left: Catalin jig for wing tip of A-30 "Baltimore"; right: metal drill basket placed over jig, holding splice angle in place while skins and stiffeners are drilled and parkered together.

Left: Catalin frame for checking pilot house frame opening; right: fixture to check formed "Plexiglas".



Left: A Catalin torch welding fixture with an aluminum block set up in the area to be penetrated by the torch; right: Catalin torch welding fixture in actual use.

# WPB'S OFFICE OF WAR PRODUCTION RESEARCH AND DEVELOPMENT

Coordination and expediting of research projects by the Office of Production Research and Development (OPRD) of the War Production Board in the past year have made important contributions to increased war production.

OPRD sponsored projects have developed successful substitutes for scarce tin, light metal alloys, wood pulp, rubber, adhesives, and ship timbers. Scores of research projects carried out under OPRD sponsorship have developed valuable wartime processes ranging from more efficient operation of blast furnaces, which increased production from furnaces by 10 percent, to an electrical method for piercing diamonds, which cut the time required to produce a diamond die for drawing fine communications wire from 200 to 50 hours.

As the technical research agency for WPB, OPRD does not itself carry out the research and tests, but evaluates, initiates, finances, and coordinates practical wartime research projects, many of which will have lasting postwar applications. The actual research work has been and is being done by academic and industrial research groups employing thousands of experts. In those instances where the research is not of immediate commercial value, but is necessary to the prosecution of the war, OPRD has supplied necessary funds.

The importance of OPRD's work is measurable not by the amount of research expenditures, but by its effect in increasing and expanding war production. For example, OPRD spent $200,000 for research on one war project, with the result that industry and government invested an additional $50,000,000 and the project was brought to a successful conclusion months earlier than otherwise would have been possible.

A partial list of wartime projects, completed with practical results under ORPD sponsorship, includes the development of mica testing instruments, spectographic analysis of metals and alloys, a process for producing synthetic quinidine from quinine, methods which increased penicillin production, fluoroscopic inspection of castings, a modified coking process for Midwestern coal, and lamination of timbers for ship construction. Other projects under OPRD auspices developed the use of fiber and pitch from scrub palmetto as a substitute for rubber in packing projectiles and bombs for shipment overseas, a climatometer for maintaining artificial weather conditions, and a rubberless adhesive material.

No small part of the activity of OPRD has been in advising industry on more efficient war production processes. This assistance includes advice on the conversion from laboratory to plant processes of penicillin manufacture, information on the building of DDT insecticide plants, advise on processes for producing small precision castings for gun parts, and anhydrous hydrofluoric acid as a catalyst in aviation gasoline manufacture, correlation of data on the use of milling machines and gasket making machines, and information on waterproof materials and large magnesium forgings.

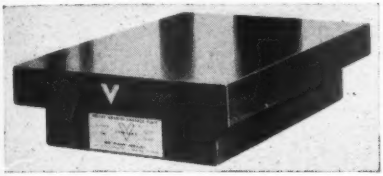
Projects being carried on at present include one on the conservation of eyesight in industry, a study to eliminate flaws in steel artillery shells, development of a coating for wirewound radio and radar resistors, a process for making industrial alcohol from wood waste, and processes for efficient production of vinyl pyridine rubber and of channel carbon black for tires.

Other studies assisted by OPRD resulted in the publication of a pamphlet on the use of music and sound in industry as a spur to war production. A program for quality control of war plant production though application of statistical methods to testing products was begun by OPRD in the Spring of 1942 and more than 30 courses in quality control methods have been given for plant inspectors, executives and other employees.

# PROGRESS ON PARADE

*Use our postage-free Inform-a-Gram for your requests.*

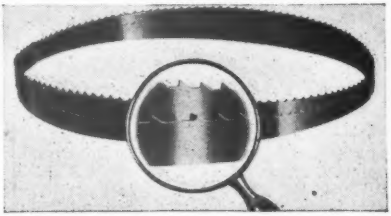
**BLACK GRANITE SURFACE PLATE.** Black diamond granite has been found to be an ideal material for surface plates since its molecular structure makes it harder than tool steel and it cannot be warped or otherwise distorted by any condition to which a surface plate is subjected. Velsey Surface Plates are lapped to a tolerance of .00005" surface



flatness. Since the granite has been aging for millions of years, the plates are immune to damage from shock or temperature change. Velsey Surface Plates do not rust, which causes high and low spots; and the surface is not upset when accidentally struck by an instrument or workpiece. Abrasion or lapping is impossible since the surface will not retain abrasive particles. Velsey Surface Plates are regularly made in three sizes—12" x 18", 18" x 24" and 24" x 36"; however, special sizes can be made to order. They also are available in portable table units. These are mounted on a stand which can be rolled to any job. STATE MANUFACTURING & CONSTRUCTION CO., Franklin, O., distributor of Velsey Surface Plates, will forward full information and quotations on request.

*INFORM-A-GRAM KEY No. 138-V*

**THE NEW SKIP TOOTH BAND SAW** which has recently been introduced by the W. O. Barnes Co., Inc., is designed for cutting magnesium, aluminum, soft brass and other nonferrous metals; and for the cutting of plastics, composition, fibre, wood, etc. The Skip Tooth provides greater chip clearance and is shaped to practically eliminate loading and clogging of the teeth, so common in cutting soft alloys with high speeds and heavy feeds. The Barnes Saw, which is of hard edge, flexible back construction, fits any standard band saw machine. It can be used

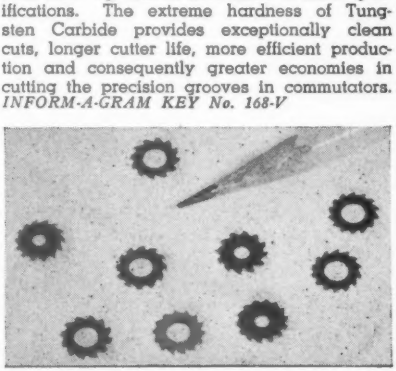


until completely worn out without resharpening, thereby reducing "down-time" to a minimum. Detailed information will be sent by W. O. BARNES CO., Inc., 1295 Terminal Ave., Detroit 14, Mich.

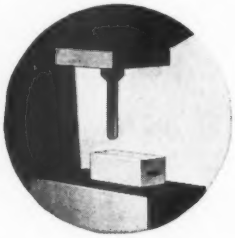
*INFORM-A-GRAM KEY No. 203-V*

**SOLID TUNGSTEN CARBIDE COMMUTATOR SAWS** ranging from ¼" to 1" in diameter can now be furnished by the SUPER TOOL CO., 21650 Hoover Rd., Detroit 13, Mich. They can be supplied in thicknesses from .015" up and in hole sizes to meet specifications. The extreme hardness of Tungsten Carbide provides exceptionally clean cuts, longer cutter life, more efficient production and consequently greater economies in cutting the precision grooves in commutators.

*INFORM-A-GRAM KEY No. 168-V*



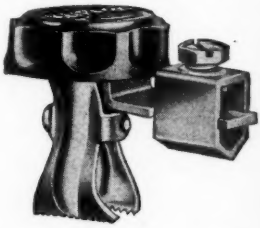
**ANTI-WEAR ANVIL BLOCKS.** These Anvil Blocks can be wrung to any flat anvil (serrated or plain) and will adhere firmly, hence their use indefinitely protects comparator anvils and the anvils of similar measuring equipment against wear. Acme's new Anvil Blocks are lapped flat and parallel on all four sides to within a few millionths of an inch and are made of hardened and seasoned gage block steel to insure accurate readings. The standard size is ½" wide, ½" high and 1⅜" long, and other sizes can



be furnished to meet special requirements. The Anvil Blocks are a product of Acme Scientific Div. of ACME INDUSTRIAL CO., 206 N. Laflin St., Chicago 7, Ill. Ask for Bulletin 443 giving complete details.
*INFORM-A-GRAM KEY No. 59-V*

**THE C-T SILENT STOCK TUBES,** used with automatic screw machines, are acoustically engineered to eliminate the banging and clattering of bar stock revolving at high speed in the machine. Even when hexagonal, square or other "noisy" bars are machined in closely packed screw machine departments, a conversation can be carried on in a normal voice if these silent stock tubes are used. Such installations have also lessened absenteeism of operators due to decreased din and fatigue. Spoilage is reduced when each operator is enabled to listen to his machine and detect operational faults. C-T Silent Stock Tubes can be readily installed on most standard stock stands. The manufacturer, CORLETT-TURNER CO., 4013 West Lake St., Chicago 24, Ill., will send conversion costs and details on the C-T Silent Stock Tubes.
*INFORM-A-GRAM KEY No. C77-V*

**HEAVY DUTY TEST CLAMPS.** Because of the tremendous jack-screw gripping action of Kliplok Heavy Duty Test Clamps, they can be used for making heavy duty temporary connections, for meter and motor testing, jumpers, battery charging, cable and bus-bar taps, welding and many other shop and laboratory purposes. The pressure exerted by a slight twist of the large finger-tip safety knob provides a current carrying capacity of from 2 to 350 amperes on constant and intermittent duty. This pressure also prevents the clamp from slipping or "jumping off" once it is attached. Solderless lugs provide perfect and



quick electrical connections without the use of special tools and without cutting into the wire. The lugs are of generous size and are arranged to swivel around the clamp, thus permitting the wires or cables to hang in a natural position after installation. Write TRICO FUSE MANUFACTURING CO., 2944 North 5th St., Milwaukee 12, Wis., for Bulletin No. 7.
*INFORM-A-GRAM KEY No. A78-V*

**DRY DRAWING AND ANNEALING COMPOUND.** The Plasteel Corporation has announced a dry drawing and annealing compound that is applied as a waxy, aqueous emulsion. Identified as No. 268, this compound has been used with success in the deep drawing of brass and steel and is applied in varying strengths to give a very nearly imperceptible wax coating It is designed to be applied in either a drum or spray type mechanical washing machine at an operating temperature of 175°-185° F. The pieces to be run should be clean, coming either from the pickle line or from the wash. When correctly applied, the metal, after drying and cooling, should have a thin, uniform coating of the compound, hardly visible but with a slightly waxy feel to the surface. This coating contains sufficient annealing compound to prevent the formation of hard mill scale during anneal, but does produce a thin, porous, protective scale that is easily removed in subsequent pickling, leaving a clean, scale-free piece. This applies equally well to minutely imbedded hard scale that

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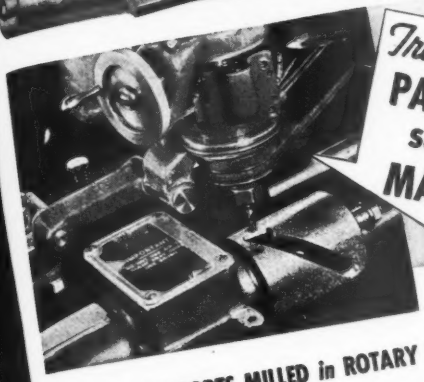
## Tracer-Controlled MILLING



## Tracer Controlled PANTOGRAPH Saves Critical MAN HOURS

Typical HIGH PRODUCTION JOB for 1000 HP. Diesel Engines

## IRREGULAR PORTS MILLED in ROTARY VALVES . . . in 30 Min. Each

This manufacturer solved the difficulties involved in milling irregular shapes in cylindrical parts by placing the job on a Gorton Tracer-Controlled Pantograph, equipped with a Gorton Roll Attachment, enabling use of only a simple, FLAT Master.

Specifications called for cutting highly finished ports in these Rotary Valves of nickel steel tubing, 7½2" thick. The required rough, semi-finish and finish cuts were completed in 30 minutes per Valve, Floor-to-Floor Time. Port was first roughed with ⅜" dia. 4-flute spiral end mill. For the semi-finish operation, tracer and cutter were changed to ¼" dia. Finish cut necessitated only a change in tracer style. To prevent chatter marks and insure the fine finish demanded, only .002" to .003" of stock was removed in the finishing cut.

**GORTON ENGINEERING SERVICE, FREE.** Submit your milling problems like these to Gorton Engineers. Use their specialized experience in Tracer-Control Milling to solve your problems—recommendations made without charge or obligation. Send part or print and specifications to your nearest Gorton Dealer, or direct to the Gorton Factory at Racine, Wis.

Gorton Tracer-Controlled Machines simplify difficult operations like this, because they are quickly set up, and easily operated with less skilled labor than by other methods. Tracer-Control assures uniform accuracy. The versatile Gorton Roll Attachment permits milling or engraving of continuous designs, completely around rolls, tubes, etc. For further information, send for both Bulletins offered below.

**JOB IN BRIEF . . .**

**PART**—Valve.
**OPERATION**—Rough, Semi-Finish and Finish Milling of irregular-shaped port in Valves.
**MACHINE**—Gorton 3-Z Pantograph.
**ATTACHMENT**—Gorton Roll Attachment 740-1.
**CUTTERS**—⅜" and ¼" four-flute, spiral, end mills.
**MATERIAL**—Nickel Steel tubing, 7½2" wall thickness.
**PRODUCTION**—30 minutes per Valve, floor-to-floor.
**FINISH**—Exceptionally smooth.

The *Right Size* The *Right Type* of Machine for Every Job . . .
From 2 oz. to 2 ton

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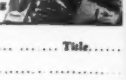
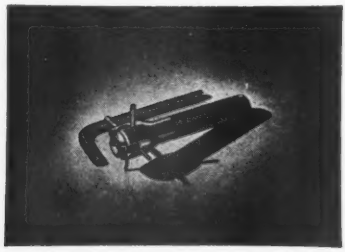


Name..... Title.....
Company.....
Address.....
City..... State.....

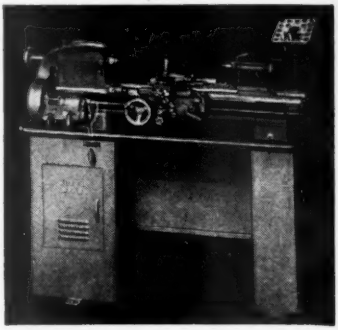
might have been on the piece before the drawing operation. The pieces can be drawn as they come from the washing machine without the use of a coolant or added lubricant. This gives a final product that is smooth and clean; and if two draws in sequence are desired, it generally has been found unnecessary to re-apply the drawing compound before the second draw since there is sufficient residual compound from the first draw. When there is a cleaning, annealing or pickling operation interposed between two draws, it will be necessary to re-apply the compound. Additional data will be furnished by PLASTEEL CORPORATION, 3900 West Jefferson Ave., Ecorse 18, Mich.
*INFORM-A-GRAM KEY No. C78-V*

**BROOKS WRENCH HOLDERS** are now available in a convenient new set which accommodates four progressive sizes of wrench for all makes of hollow head socket screws. Four holders will cover all screw sizes from No. 4 to 1½" and the wrenches can be changed about in the holder in order to use their short or long ends. Since there is a specific slot for each size of wrench, the holders



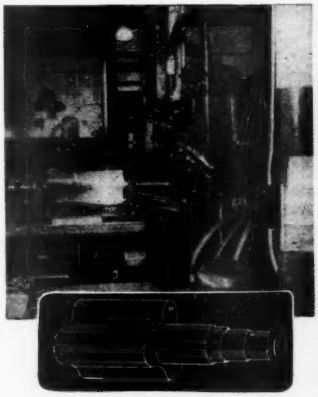
provide a complete set of wrenches ready for use. Also, with the inclusion of four wrenches of progressive size in one holder, the time wasted in selecting the proper size to fit a socket is cut to a minimum. Another important advantage is the ease and sensitiveness with which a wrench can be used when held in this handle-shaped holder. The Brooks Wrench Holder is sold by THE MICRO TOOL CO., 30 Sigourney St., Hartford 5, Conn., who will send additional information on request.
*INFORM-A-GRAM KEY No. C76-V*

**A NEW 9-INCH TOOLROOM LATHE** is announced by South Bend Lathe Works which has a 9¼" swing and takes 22" between centers. It has a maximum collet capacity of ½" and a ¾" spindle bore. The 12 spindle speeds range from 41 to 1270 rpm, with back-gear drive for the lower speeds. A quick change gear box permits cutting 48 pitches of screw threads, 4 to 224 per inch and provides 48 power longitudinal feeds and power cross feeds. The lathe is equipped with a handwheel draw-in collet attachment, collet rack, taper attachment, thread dial indicator, thread cutting stop, large and small face plates and micrometer carriage stop.

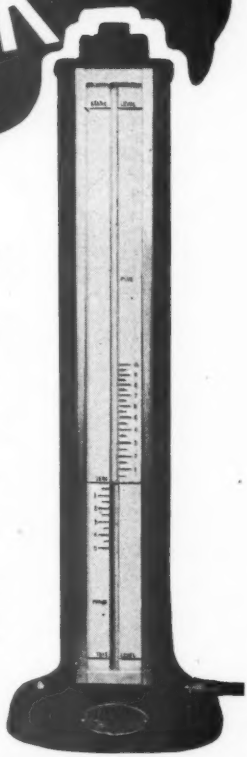


Additional attachments to simplify the machining of special classes of work are also available. SOUTH BEND LATHE WORKS, 391 E. Madison St., South Bend 22, Ind., will send complete information.
*INFORM-A-GRAM KEY No. 564-V*

**PLANING CURVED SURFACES.** A new attachment manufactured by the Turchan Follower Machine Co., has filled the need for a speedier method of planing curved surfaces such as the gear-like impeller for water-pumps, gas exhausters and blowers. The Turchan attachment permits finishing the three symmetrical vanes to a tolerance of .001" in one-seventh the time formerly required by hand methods. The planing of the piece, 1 ft in diameter and 3 ft in length,



# The METRICATOR



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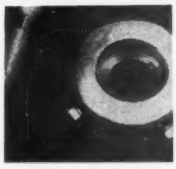

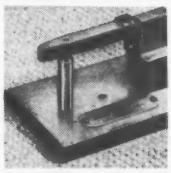

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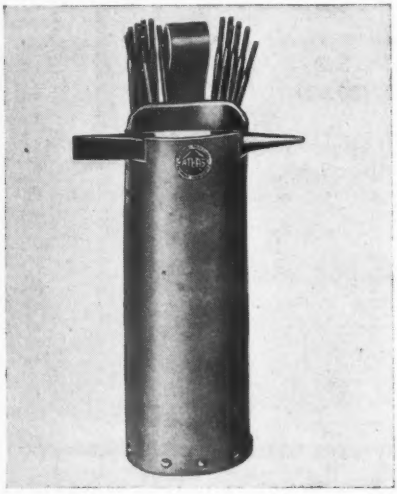
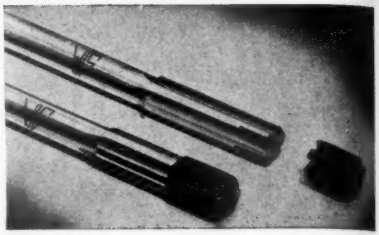
is performed in three stages by following a master template of one-third of the profile and indexing the part as each third is completed. The planing can be done so accurately that no handwork is needed. TURCHAN FOLLOWER MACHINE CO., 8257 Livernois, Detroit 4, Mich., will forward full particulars.
*INFORM-A-GRAM KEY No. 104.5-V*

**CASE FOR WELDING ELECTRODES.** The new Atlas Dual-Case is not only designed to carry a supply of electrodes suspended from the welder's belt, but an extra division is provided for carrying an Atlas Weld Cleaning Tool. This case eliminates having electrodes strewn over the floor and thus prevents the scrapping of welding electrodes due to cracked and chipped flux coating. Another feature is

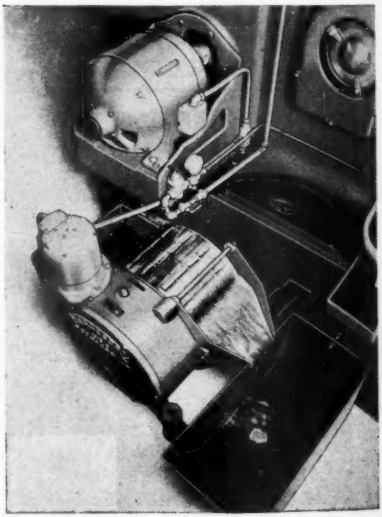


the time saved in having both electrodes and chipping hammer constantly at the welder's hand. Long life is assured by heavy harness leather construction, riveted for permanence. A broad loop is provided for attaching to welder's belt. Capacity is 8 to 10 pounds of electrodes; height of case is 12" and the diameter is 3½". The Dual-Case is made by ATLAS WELDING ACCESSORIES CO., Dept. T, 14828 Wyoming Ave., Detroit 21, Mich., who will send full particulars on request.
*INFORM-A-GRAM KEY No. C58-V*

**PLASTIC COVERINGS FOR CARBIDE TIPPED TOOLS** to protect cutting tools from damage in transit or in the stockroom or toolroom bin are now used by WENDT-SONIS CO., Dept. T, Hannibal, Mo. Immediately after final inspection at the plant, this strong plastic coating is applied to each tool tip. The hard and durable covering remains in place until inspected by the purchaser and then it can be slipped back over the tool tip, providing permanent protection in tool storage. Although the covering is air and moisture proof after initial application, it will not leave any gummy residue on the working surfaces when removed from the tip. Write for information on the Wendt-Sonis line of carbide tipped tools.
*INFORM-A-GRAM KEY No. 518-V*



**MAGNETIC-AUTOMATIC SEPARATOR.** A new method for automatically removing harmful metal and abrasive particles from honing coolants having a non-soluble base has been incorporated into the new BarnesdriL Separator. With this new unit, all swarf and magnetic particles are removed through magnetic attraction, thus saving the time formerly spent cleaning and changing filters. It is a self contained, motor-driven unit, employing a magnetic drum which attracts metallic particles as they pass through the coolant and carries



GRIFFIN PROCESS is applicable on thread plug gages from ⅜" up and on thread ring gages from 1" up.

**GRIFFIN PROCESSED THREAD GAGES** have all threads ground in a solid deposit of tough, wear-resistant chromium carbide alloy. Worn gages are salvaged by removing old threads, welding on a thick deposit of chromium carbide alloy and grinding new "on size" threads in the alloy. Thus, threads are ground in carbide from root to the crest—are not just a plated surface.

**GRIFFIN PROCESSED THREAD GAGES** give many times the service of ordinary tool steel gages because of the extreme wear resistance of the chrome carbide alloy. Average life increases are twenty times, depending upon the type of material being gaged. Users have reported up to 60 times more life in exceptional cases!

●

**Send your old gages for reconditioning or order new gages made by the Griffin Process. Highly economical, fine workmanship, prompt deliveries! Write for our free folder describing the complete *Griffin Process* for increasing thread gage life!**

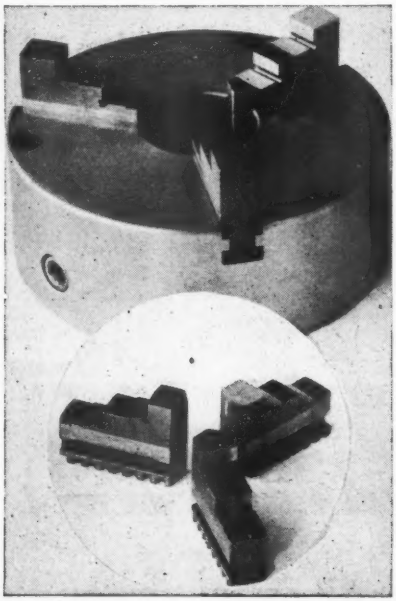
**GEORGE O. GRIFFIN COMPANY**

1301 WEST HADLEY STREET • WHITTIER, CALIFORNIA

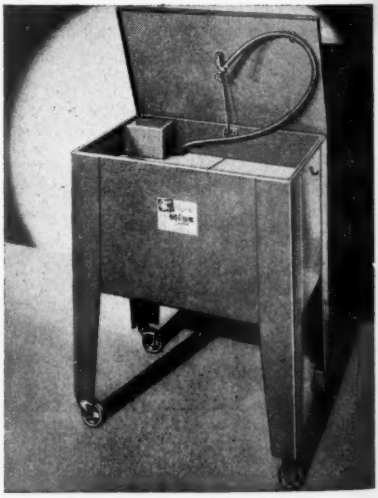
*Chrome Carbide Thread Gages*

them out as the drum rotates. The coolant flows rapidly in a thin wide channel through the lower part of the Separator in a counter direction to the slow rotation of the drum. As the drum rotates, the entire sludge mass is scraped off and discharged through a chute which returns the coolant to the reservoir in the base of the machine and is ready for immediate recycling. The BarnesdriL Separator is easily installed and used on both vertical and horizontal honing machines; it may also be used on grinding machines when a soluble solution is used as the coolant. The Separator is now available in two sizes, both employing ¼ hp motors. Capacity of smaller one is 10 gal. of coolant per minute and weighs 500 lbs.; the larger handles 20 gal. per minute and weighs 600 lbs. Ask for Bulletin 151-A when writing BARNES DRILL CO., Dept. T, Rockford, Ill., for additional data.
*INFORM-A-GRAM KEY No. C60-V*

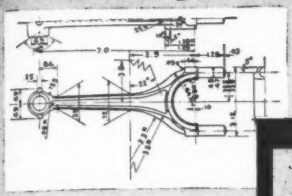
**A NEW IDEAL "UNIVERSAL" 3-JAW CHUCK** has recently supplemented the Ideal Commutator Dresser Co.'s line of machine tool accessories. The body of the chuck is made of high tensile strength semi-steel; its ribbed construction provides ample resistance to shock loads and unusual stress. An unfinished adaptor plate is furnished for mounting on any lathe. The scroll is of heavy proportions to assure long life and true turning. Two sets of jaws, one for internal work and the other for external work, are furnished with each chuck. In case one of the jaws is damaged, only the damaged one need be replaced and then ground to match the others. The Ideal Chuck is available at present in the 5" size only. For full particulars, write IDEAL COMMUTATOR DRESSER CO., Dept. TD, Sycamore, Ill.
*INFORM-A-GRAM KEY No. 329-V*

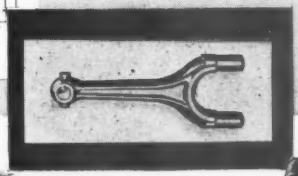


**PARTS CLEANING SYSTEMS.** The Gray-Mills Co. of Evanston has announced a new Parts Cleaning System which combines the utility of two washers into one self-contained unit. The system includes a portable cleaner with a unique "swisher" feature and cold-cleaning Flo-Bac solvent. A strong stream of solvent pumped from the tank below is used in cleaning large parts, which require individual handling, of grease and grime. Smaller parts may be washed in quantity by merely loading them into a basket and immersing in the solvent. The dipping basket rests on the simple, hand-operated "swisher" device, which speeds the cleaning operation by providing a convenient method for agitating fluid. The cleaning unit is equipped with a built-in gear-type pump and is fully portable. The Flo-Bac solvent, which is used cold, degreases parts without causing pitting and corroding and is used over and over, being continually filtered. Gray-Mills Cleaners quickly wash parts such as castings, gears, bearings, carburetors, air cleaners, machine products and tools. The two models available are the P70, as illustrated, and the P60, a smaller model. A four-page folder giving complete information will be sent on request by GRAY-MILLS CO., Dept. TJ, 1951 Ridge Ave., Evanston, Ill.
*INFORM-A-GRAM KEY No. 555-V*



# How Many Hours Would You Need to Mill this Master Hob?





Speed, economy and accuracy are typical performance features of a Milwaukee Rotary Head Milling Machine. The milling operation on this master hob is an excellent example. *Read this job report* —

**MASTER HOB** — MATERIAL — High Carbon—High Chrome Steel. TIME DISTRIBUTION—Set-up, ¾; Layout, 1¼; Rough Mill Complete, 10; Finish Mill Complete, 29. A total time of 41 hours.

Check these advantages of the Milwaukee Rotary Head Milling Machine and how you can benefit from them in your own shop:

DIRECT . . . mills mold cavities in a single set-up without the aid of templets or models.

ACCURATE . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements — possible only with this machine — transmits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

*Write for Bulletin No. 1002C and complete information.*

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • FACE MILL GRINDER • AUTOMETRIC JIG BORER • SPEEDMILL • MIDGETMILL • CENTER SCOPE.

**KEARNEY & TRECKER**

*Products*

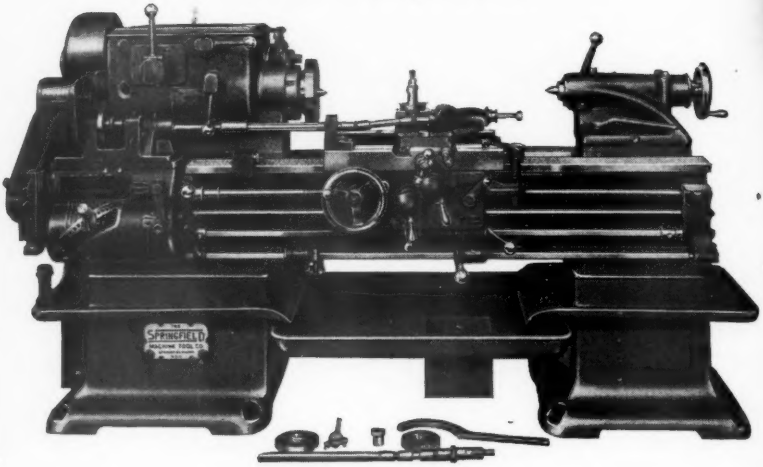
**CORPORATION**

**Milwaukee 14, Wisconsin**

Subsidiary of Kearney & Trecker Corporation

# SPRINGFIELD PRECISION LATHE

## *Out in front!*




● Headstock . . . twelve speeds . . . only half of the easy-shifting spur gears mesh at one time.

Motors . . . V-Belt or silent chain drive.

Bed . . . permanently true—made of high test alloy to resist warp or marring under severe service.

Apron . . . extra heavy—operates on Ball and Bronze bearings throughout.

Taper attachment . . . hair-trigger adjustment.

Compound rest . . . sturdy, firm.

Tailstock . . . all bearings and bed ways oiled from one well.

From headstock to tailstock—the SPRINGFIELD Lathe is *out in front!*

**SEND TODAY FOR BULLETIN No. 163**

Tells the why and how of Springfield's accurate production.

**THE SPRINGFIELD MACHINE TOOL CO.**

SPRINGFIELD • OHIO, U. S. A.

# INDUSTRIAL DIGEST

SCIENCE • RESEARCH • METHODS • TOOLING
PRODUCTION • TRADE NEWS AND REPORTS

## G-E's Annual Review

General Electric's annual review of the electrical developments of the past year appears in the January issue of the General Electric Review. The emphasis is on armament, munitions and weapons, particularly in the fields of aviation, communication, power and marine transportation.

Several of the features in aviation are central station fire control, developed especially for multiple gun turret fire on the B-29 and the P-61. Fire computers which enable one gunner to control as many as three turrets is another development. New aircraft instruments developed include a compass transmitter and indicator, a landing-gear and flap-position indicator, a gas gage indicator and set of transmitters for totalizing three tanks, and other indicating and control instruments.

Extensive developmental work was carried on to explore the possibilities of high temperature motors using silicone. The world's fastest motor, operating at 120,000 rpm, was developed for special high speed grinding and drilling of precise aircraft instrument ball bearings. Other motor developments include a synchronous direct current motor and a new line of vertical shielded (drip-proof) hollow shaft motors. Flamenol, a thermoplastic synthetic insulating material, was developed for insulating wire and cable. This insulation was successfully applied to small diameter wire for use in wet locations.

Despite heavy demands on the production facilities of turbine manufacturers during 1944, hundreds of thousands of kilowatts of turbines were built for stationary power plants in this country, as well as some for export. A feature was the prominence in the development of the gas turbine, particularly in the turbo-supercharger for high altitude flying, and the power plant for the jet propelled planes.

Turbine gear propulsion equipment for the U. S. Navy reached a peak in 1944. A total in excess of 7,800,000 hp in main propulsion turbines of all classes was produced. Auxiliary motors and controls particularly for landing craft (LST and LSM) were produced in considerable quantities. The output of turbine-electric equipment for tankers and diesel-electric propulsion equipment also was large.

Other types of developments include switchgear, rectifiers, control equipment, heating, rubber, plastics, paper and textile, railroad and urban transit.

There is also a section on the principal types of research carried on by the electrical industry in the past year.

## New Kennametal Detroit Office and Manager

Kennametal Inc., of Latrobe, Pa., has announced the removal of their Detroit branch to larger offices at 5531 Woodward Avenue to facilitate distribution and servicing of their products throughout the Detroit and eastern Michigan Area by an augmented staff of Tool Engineers. An adequate stock of standard Kennametal tools and blanks will be maintained to provide immediate delivery of urgently needed items.

Bennett Burgoon, Jr., for several

years the Kennametal Representative at Rockford, Ill., has been made District Manager in charge of the Detroit Office.

## Apprenticeship Builds Craftsmen

"Never in the history of our nation has there been the need for training of industrial craftsmen that exists today". William F. Patterson, Director Apprentice-Training Service, Bureau of Training, War Manpower Commission, keynoted his talk before the Syracuse meeting of the American Society of Tool Engineers with this statement. Patterson pointed out that unless sufficient new young blood is brought into the precision metalworking industries through apprentice training the skilled worker situation is destined to an even more serious depletion.

Mr. Patterson's prediction was based on statistical evidence of the increase in the average age of craftsmen in these industries, and the comparatively small number of youthful workers who have been trained.

"The median age of skilled men in the machine trades in 1940," he said, "was 38.1 years. In 1930, it was 34.6 years. This shift in a decade strongly suggests that a sufficient number of craftsmen are not being trained to maintain a satisfactory balance as to age and quantity. Our statistical studies show that in many trades, including the machine trades, our craftsmen have been aging rapidly. Time, aided and abetted by long hours of work and war anxiety, is taking a heavy toll. We are coming to a period where a high degree of skill is essential, not only to its possessor, but to the establishment in which he works. Never in the history of our nation has there been the need for training of industrial craftsmen that exists today. The war interrupted and curtailed our national apprenticeship program just as its benefits were beginning to be realized."

Referring to the need for skilled men during the post-war era, Mr. Patterson


SPEEDS THE JOB!

THE UNBRAKO KNURLED SOCKET HEAD CAP SCREW

REG. U. S. PAT. OFF.

It speeds the job because its knurled head affords a slip-proof grip for oily fingers—the "Unbrako" can be turned farther and faster before a wrench is needed. The time thus saved adds up mightily, and means increased production.

The Knurled "Unbrako" Cap may be locked in place.

Sizes from #4 to 1½" diameter. Full range of lengths.

● Knurling of Socket Screws originated with "Unbrako" years ago.

For full information send for the "Unbrako" Catalog of Screw Products

OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 600

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# Broaching news

MULTIPLE SPLINE PROCESSING

BRAKE INSER SLOTTED BY BROACHING

Dual Lead Angles Broa

Queries And Answers On Broaching

PRECISION NUTS NOW BROACHED

BROACHED BLADES FOR NAVY TURBINES

Broaching Sprockets

DO'S AND DONT'S ON BROACHING

Broaching Pump Rotors

BROACHING METHODS AND APPLICATIONS

Broaching Connecting Rods

Broaching Carburetors

Broaching Garand Rifles

Zero Backlash Splines

Broaching Tractor Links Increases Accuracy In High Production

Getting the Most Out of Your Broaches

BROACH RE-SHARPENING

said: "I do not mean to imply that the man with knowledge and skill has not been a priceless asset both in war production and in the armed forces, but there are essential differences in production for war and production for peace. The promotion and development of a national apprenticeship program, which will bring to all young workers in a skilled trade the advantages of apprenticeship, is an enormous job."

Mr. Patterson explained that the size of the training job ahead was due largely to the shortage, during the war, of young men on the home front who qualify for apprenticeship. This shortage, he pointed out, has opened up great opportunities for returning veterans. To enable ex-service men to have the advantage of apprentice training, and equip them for an industrial career, he said that employers and labor in many of the major industries had amended the eligibility requirements for this training, including age qualifications. To permit veterans who are beyond the customary age limitation for apprenticeship to have the benefits of this training, the number of years they have served in the military forces is not counted, Mr. Patterson said.

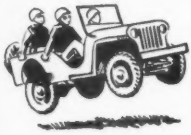
In discussing the subject of apprenticeship, Mr. Patterson stressed the value of production of apprentices during their training. He stated that management has learned to talk and think of training "in terms of an investment—in terms of quantity and quality of production." In order to answer some of the dollars-and-cents questions of management and particularly training directors, he said that Apprentice-Training Service had recently issued a pamphlet, entitled "Evaluating Apprentices".

"This pamphlet," he said, "endeavors to set forth elements to be taken into consideration in determining what dollar value the apprentice returns to his employer, as against the wages paid and the various elements which may fairly be charged against him."

**"A Plan To Help Industry Help Industry"**

"A Plan to Help Industry Help Industry" has recently been presented to Trade Associations by the Industry Association Committee, Bureau of Manpower Utilization of the War Manpower Commission.


BUILDERS 'T' SURFACE GRINDER



SMALL
RUGGED
USEFUL

Builders hand operated 'T' Grinder is the "Jeep of the toolroom". Small in size, it does the work of large, expensive machines. Rugged construction assures years of odd job precision grinding or production surfacing.

*Prompt delivery.*
*Send for Bulletin 644*

BUILDERS
IRON FOUNDRY
23 Codding St.
Providence 1,
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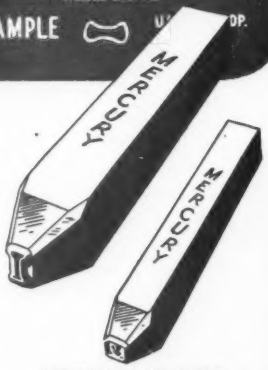
## . . . or made to order!

**Standard and special inspection stamps to meet almost *any* metal marking requirements are available from Mercury!**

Send us a drawing or sample of the impression you require, and briefly outline your marking problem. The stamp to fit your needs is probably ready for delivery—or can be quickly made to your specifications. *Complete manufacturing facilities are available to solve your marking problem.*

WRITE DEPT. D FOR FULL DETAILS—TODAY!



**METAL MARKING TOOL SPECIALISTS FOR 25 YEARS**

**MERCURY METAL DIE AND LETTER CO.**

546 EAST 16TH STREET, LOS ANGELES 15, CALIFORNIA

The urgent need throughout industrialized America for additional manpower can be met, at least in part, by better utilization of the existing supply of manpower within each industry. Trade Associations in each industry have been requested to participate in the plan and to uncover methods, means and devices adopted by their member organizations which have resulted in better manpower utilization, or savings in time or materials. This information will be gathered by the Trade Association and prepared in case history form. Cases having general applicability will be made available to all association members.

The War Manpower Industry Association Committee will act as a medium between industries for the exchange of ideas, methods and improvements so that the accomplishments of one industry will be made available to all others. More than 100 Trade Associations are already taking an active part in the plan and excellent results have been obtained. The American Pulp & Paper Association representing a large, important industry, an industry long convinced it had reached near perfection in operations, was instrumental in uncovering ways and means to reduce that industry's manpower requirements by 25 percent.

Because Trade Associations have the necessary machinery and influence in their industry to conduct surveys and compile results, the Industries Association Committee believes that their cooperation can contribute much to America's war effort. Such cooperation is important not only in war but in peace. Conversion to civilian production, keen competition for a fair share of domestic and foreign markets and probable rising wage scales demand the better utilization of our manpower.

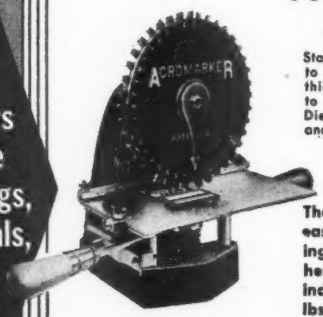
Trade Associations will ask their members what actually has been done within individual establishments to: reduce the work content of the job; improve production or operating methods; improve working conditions; reduce absenteeism and turnover; substitute women, older people, handicapped or part time workers; use new mechanical

For marking numbers and letters into name plates, tags, parts, seals, discs, in metal, material, etc.

THE ACROMARKER FOR PERFECT MARKING

*Features:*

Stamps nameplates up to 9" x 5" x 3/8" thick. Die sizes 1/16" to 1/8". Dies are replaceable, and automatic advance permits accurate character spacing. Operating lever requires only a minimum of effort for clean, deep markings.



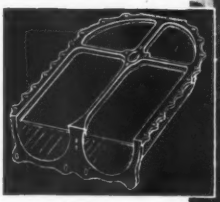

*Write for literature*

The ACROMARKER is a remarkably easy-to-operate marking machine offering faster, more accurate marking than heretofore possible. Widely used in industry, this model weighs only 30 lbs. It stamps letters and figures in straight or curved lines. With it unskilled help can do the work of skilled men faster and accurately.

THE ACROMARK CO.

5-15 MORRELL STREET, ELIZABETH 4, NEW JERSEY

# *How* TO AVOID BUYING EXPENSIVE MACHINES FOR CONTOUR JOBS!



*"Turn to Turchan"*

In cutting contours, the Turchan Follower Attachment can frequently be used with machines which you already have in your plant, thus avoiding the expense of buying special machines costing several times as much.

One of the numerous examples of the Turchan's adaptability to work of this character is seen in the above illustration which shows a vertical mill being used to mill the interior contour and outside flange of a 14" x 14" carburetor housing.

If you have a prospective job of finishing parts of irregular or eccentric shape, and would like to find out how you can avoid buying a special machine, here's what to do:

## *Investigate the Turchan!*

Send us a blueprint or sample of part, together with information as to what machines you have—milling machines, lathes, grinders, shapers or boring mills—and we will show you how a Turchan Attachment will do the job.

**TURCHAN** **TURCHAN FOLLOWER MACHINE CO.**
**8257 Livernois - Detroit 4, Mich.**

*Hydraulic Follower Machine*

and other equipment or change present equipment; consolidate jobs where possible; eliminate frills and special services; eliminate waste in materials of all kinds, etc.

**Lockheed Safety Record**

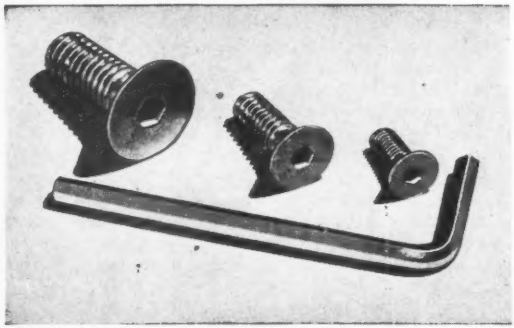
Good Housekeeping and Safety—The Lockheed B-17 sub-assembly plant at Fresno, California, is the safest place to work of all Pacific Coast aircraft factories according to figures announced by the company's Safety Engineer, Jack F. Hatton.

There has been no "lost time" accidents in the Lockheed factory since September, 1943. This means 1,500,000 hours of consecutive work without mishap. The immediate goal for the factory is the 2,000,000 man-hour mark. Much of the credit for this excellent record must go to the employees' Good Housekeeping Committee which insures clean aisles and neat working areas. Most factory accidents are caused by carelessness, someone stumbles, falls or drops something. The Fresno factory has a safety-minded work force, aided by a supervisor's general safety committee and a workman's safety committee. Employee suggestions have been important in cutting accident rates.

**Voluntary Arbitration Rules**

The agreement of management and labor unions to use the services of the Voluntary Arbitration Tribunal to settle labor disputes and commercial controversies has risen 100% during 1944 according to a report by H. O. King, President of the American Arbitration Association.

The bulk of the cases handled by the Association were, by the agreement of labor and management, the final step in grievance settlement. The Association exercises no judicial functions. It is a non-profit, impartial agency, providing

WE DELIVER THE GOODS!

SOCKET FLAT HEAD CAP SCREWS

Available now in 90 standard sizes from No. 4 to 3/4" diameter, and from 1/4" to 3" length overall. Stocked both in American N. C. and N. F. threads. For catalog—or when ordering—write or phone . . .

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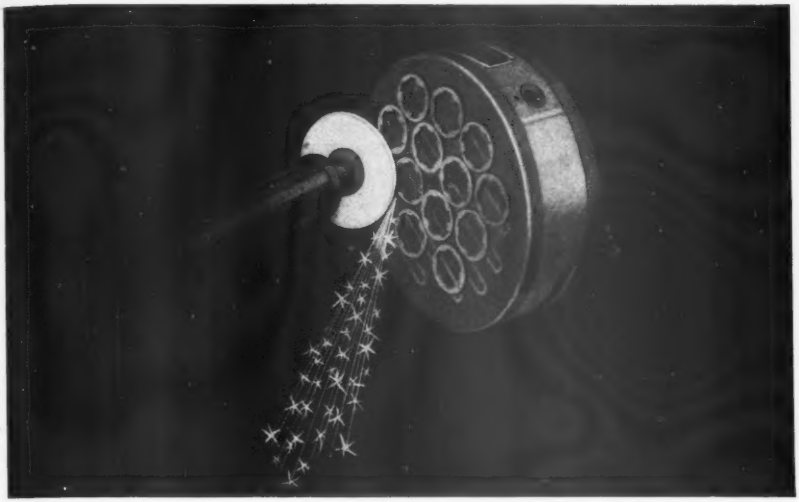


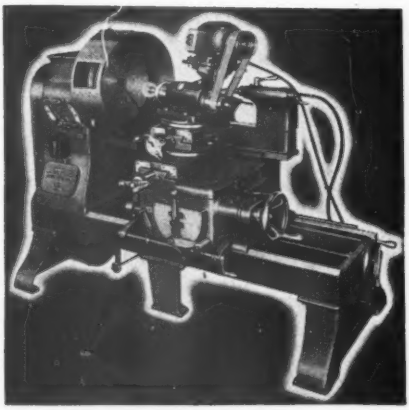
# GANG UP ON 'EM

This extremely versatile machine—the Lempco Model HGX Heavy Duty Universal Grinder—has met wide-spread acceptance—particularly with post-war minded shop superintendents and executives. For its heavy-duty construction is built for long, war-time runs. Yet its wide capacity and quick set-up features make it practical for special jobs in the tool room, in tool and die shops, as well as ideal for the many varieties of jobs that post-war conversion will require.

## MODEL HGX HEAVY DUTY UNIVERSAL GRINDER

53 inch swing. Turns and grinds internal, external, face, and taper jobs. Three quick-change speeds for both cross-feed and table feed. Automatic trips and feeds insure accurate work. Ceiling-priced. Good delivery.

*WRITE FOR CATALOG*



**LEMPCO**

**5713 DUNHAM ROAD**
**BEDFORD, OHIO**

arbitration facilities and arbitrators selected by the agreement of labor and management.

On the basis of experience gained in thousands of cases, the rules for 1945 have been revised and are available at the Association Offices, 9 Rockefeller Plaza, New York.

## Bombsight Bearings

Only a select few military and industrial leaders knew at the time how close our Army came to losing its ability to shatter the enemy industrial system.

The Army has just revealed that the production of the Norden Bombsight almost ceased in 1941 for the lack of a precision ball bearing on which it depended for its accuracy. At Wright Field the Air Forces Technical Services Command found that the balls for the bearings were made in Sweden, Germany and Switzerland, and by the summer of 1941 all supply had ceased. The ball was 1/25th of an inch in diameter and the smallest American ball then made was 1/16th of an inch.

The bombsight called for 61 ball bearings and some were of the most difficult type to produce. But without them and their perfect operation our flyers would be dropping their bombs off the target. On trial at the time was the American theory of precision bombing vs. the British theory of area bombing which was not proving as effective upon the armament industries and military installations of the enemy.

Faced with this the American ball bearing industry was given the highest priority for the particular steel required and by mid-1942 these bearings, which had to be held to tolerances of from one-half to one "tenth", were in production and within one year the supply met the demand.

Special facilities were built so that control over humidity, temperature, air pressure and dust could be maintained. Women, because of their smaller hands, were used to assemble the bearings, working with tweezers and microscopes.

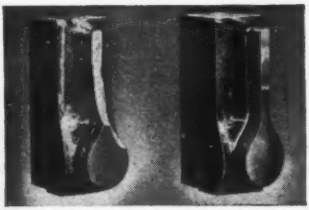
One test to which these bearings are subjected is indicative of their precision

A NEW AND SPECIAL SERVICE
TO OUR PRESENT AND PROSPECTIVE CUSTOMERS
Carbide Tipped SPECIAL PURPOSE REAMERS
Built to your requirements!
● In addition to the manufacture of specially designed reamers for the fine precision work required on small arms, radios, aircraft, precision instruments, etc., we now are prepared to incorporate this same high quality in CARBIDE TIPPED reamers. Each reamer we make—including CARBIDE TIPPED—is fashioned precisely for the work it is designed to do. Your requirements will be given immediate and expert attention.
•PHONE—WIRE OR WRITE
METAL CUTTING TOOLS AND MANUFACTURING CO.
11121 GRAND RIVER AVE. • DETROIT 4, MICH. • HOGARTH 9164-5

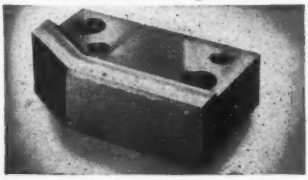
# Eureka TOOL STEEL ELECTRODES

## SAVE vital tool steel for Victory

## SAVE time in Reconversion to Postwar Products!



*Die Unit repaired with Eureka Tool and Die Welding Electrodes. No heat treatment required.*



*Compositely Constructed Die Unit using Eureka Tool and Die Welding Electrodes. No heat treatment required.*

Here are just a few examples of how Eureka Tool and Die Welding Electrodes are saving vital tool steel and countless man hours. 1. For repairing existing units that fail in operation. 2. For creating cutting edges or working areas in the composite fabrication of units using mild, medium, high carbon or S.A.E. steels as a base. 3. For correcting design by facilitating changes in contours, corners or edges during die "try-out" or "change-over" programs. 4. For rectifying errors made in manufacturing units eliminating conventional inserts. Shown at left are samples of Die units that were repaired and constructed with Eureka Electrodes. For additional technical information write today for our illustrated catalog.

★ *If you are making postwar plans now, we invite you to write us for complete information on Eureka Electrodes today.* ★

Welding Equipment & Supply Co.

**PIONEERS IN TOOL AND DIE WELDING ELECTRODES**

**223 LEIB STREET • FITZROY 3715 • DETROIT 7, MICHIGAN**

and sensitiveness. The bearing is mounted in a steel test wheel weighing 3½ pounds. As a camel's-hair brush is drawn lightly back and forth over the rim, the wheel and bearing must follow.

## Recent U. S. Patents

Among recently issued U. S. Patents the following are of Tooling interest. If you are interested in studying any of these Patents, simply advise "Patent Information Service," The Tool & Die Journal, 2460 Fairmount Blvd., Cleveland 6, Ohio, enclosing 20 cents for each Patent desired and we will gladly forward your order to Washington.

SINE VISE, No. 2,347,111.
APPARATUS FOR HOLDING WORKPIECES, No. 2,347,170.
MACHINE FOR END TAPERING METAL TUBING, No. 2,347,175.
TORQUE MEASURING DEVICE, No. 2,347,208.
TORQUE MEASURING DEVICE, No. 2,347,209.
TORQUE MEASURING DEVICE, No. 2,347,214.
CUTTING MACHINE, No. 2,347,223.
METHOD OF CUTTING, No. 2,347,245.
LATHE HEADSTOCK TRANSMISSION, No. 2,347,259.
TOOLBOX, No. 2,347,270.
SHEET METAL WORKING PRESS, No. 2,347,272.
DIAMOND DRESSING TOOL AND METHOD OF DETERMINING DIAMOND SIZES THEREFOR, No. 2,347,280.
MEANS FOR DRESSING GRINDING WHEELS, No. 2,347,283.
TOOLHOLDER FOR METAL PLANERS, No. 2,347,323.
KNURLING MACHINE, No. 2,347,350.
DUPLICATING MACHINE, No. 2,347,367.
HAND BEADING TOOL, No. 2,347,390.
VARIABLE SPEED TRANSMISSION, No. 2,347,479.
ATTACHMENT FOR MACHINE TOOLS, No. 2,347,489.
BAR-GRINDING APPARATUS, No. 2,347,503.
DRAWING MACHINE OR LAYOUT TABLE, No. 2,347,558.
INSPECTION METHOD FOR COMPOSITE ARTICLES, No. 2,347,564.
PUNCH PRESS GUARD, No. 2,347,606.
RADIUS GRINDER, No. 2,347,616.
METALLIC ARC WELDING NOZZLE, No. 2,347,646.
DEVICE FOR MEASURING EXTREMELY SMALL ANGLES, No. 2,347,702.
GRINDING MACHINE, No. 2,347,766.
TURRET HEAD ROUTER, No. 2,347,791.
CUTTING MACHINE FOR ROUND BILLETS, No. 2,347,804.
DIE, No. 2,347,808.
SELF-LOCKING NUT, No. 2,347,852.
MANUFACTURE OF SELF-LOCKING NUTS, No. 2,347,853.
METALWORKING MACHINE, No. 2,347,875.
METHOD OF GEAR FINISHING, No. 2,347,997.
GEAR CROWNING, No. 2,347,998.
SIZE GAUGE, No. 2,348,018.
LATHE, No. 2,348,052.
METHOD OF MAKING PATTERNS, No. 2,348,086.
FACE MILLING CUTTER, No. 2,348,089.
TORQUE MEASURING TOOL, No. 2,348,098.

*In War, as in Peace...*

**CERRO ALLOYS**

**SAVE TIME and CUT COSTS!**

**CERROMATRIX** (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

**CERROBEND** (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

**CERROSAFE** (Melting Temp. 190° F.) Used to accurately proof-cast cavities such as molds, gun chambers, forging dies, etc. and for many similar applications.

REPRESENTATIVES AND DISTRIBUTORS

Brklyn., N. Y., Belmt. Smelt. & Ref. Wks.
Ansonia, Conn., Jackson Associates
Boston, Mass., Jackson Associates
Philadelphia, Pa., Castaloy Metal Sales Co.
Cleveland, Ohio, Die Supply Co.
Detroit, Mich., Castaloy Metal Sales Co.
Chicago, Ill., Sterling Products Co., Inc.
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**40 WALL STREET - - - - NEW YORK 5, N. Y.**

# HOW TO *Save Time* IN DEEP DRILLING!

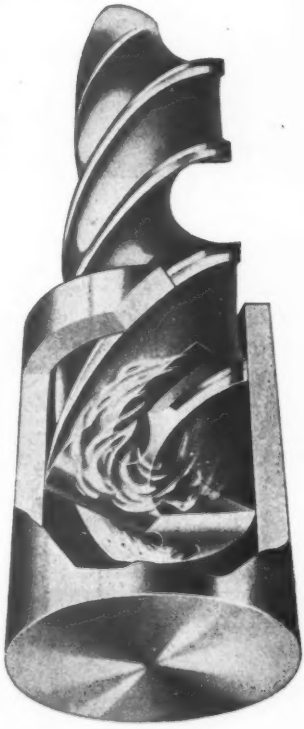
## USE A DRILL THAT YOU CAN SPEED UP!

**With a Super-Kool Oil Hole Drill you can drill at a much higher rate of speed than with ordinary drills, thus effecting a notable reduction in drilling time.**

**This is because the Super-Kool Drill provides a constant supply of oil at the cutting edge, making it possible to speed up the drilling operation without endangering the drill through overheating.**

**The pressure of the oil through the holes in the shank, in addition to keeping the drill cool, also serves to clear away the chips, thus eliminating the danger of scoring.**

**Widely used not only because of the superior work it performs but also because it has a life two to three times that of ordinary drills. Try it and see for yourself.**



**All sizes from 3/8" to 3½" in diameter and up to 36" overall**

**Detroit Reamer & Tool Co.**
2830 E. 7-Mile Road Detroit 12, Michigan

*Manufacturers of*
**Oil Hole Drills . . . . . Special Reamers**
**Circularity Relieved Reamers and End Mills**
**—*Also* Special Tools**

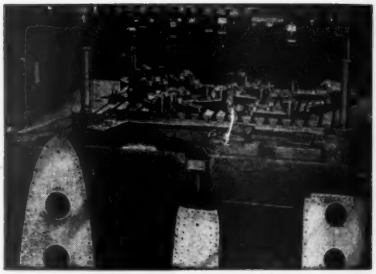
SUPER-KOOL
OIL-HOLE DRILL

# ADJUSTABLE DIES
# SPEED WAR PRODUCTION

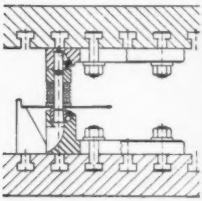
INCREASE HOURLY PRODUCTION—REDUCE "DOWN" TIME

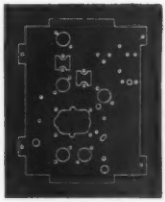
Whistler adjustable die set-up for 12 foot power brake. These same punch and die units can be quickly rearranged for other patterns.

Whistler Adjustable dies are saving the day in war plant "speed-up" schedules by...saving weeks of time normally required in single purpose die making...units can be used over and over in different patterns...new set ups on or off the press in minutes ...all parts interchangeable...work on any type press...perfect precision on long or short runs...no special tools and new workers quickly learn to make press changes.



Another grouping of Whistler Adjustable Dies illustrating re-use of same units. Note close grouping of perforations.





Side view showing construction detail of U-50 Whistler Adjustable Punch and Die unit and typical example of perforated and notched piece produced by Whistler Dies.

***Over 25 Years of Tool and Die Making Experience***

**S. B. WHISTLER & SONS, Inc.**

752-756 MILITARY ROAD BUFFALO, N. Y.

Every Production Executive needs this fully illustrated catalog. Sent upon request.

# PUBLICATION PREVIEWS

**Keep Informed!**
**CATALOGS**
**BULLETINS**
**SPECIFICATIONS**

*Use our postage-free Inform-a-Gram for your request*

**NEW "PUNISH-PROOF" FLOOR BROCHURE**—A new, permanent, acid-proof brick floor which will not crease, groove, chip, dust off, or require patching is described in a 16-page illustrated brochure just published by the BELDEN BRICK CO., Dept. TJ, Canton, Ohio. Bonded with acid-proof cement, this floor repels organic, physical and chemical attack, holds up under the cutting action of steel-wheeled trucks, resists oil, water, acids, and has a crushing strength of 18,500 lbs.

to the square inch. The floor is designed as a universal working surface for all branches of industry—dairies, meat packers, food processors, foundries, all metal working plants, chemical plants and institutions. Complete instructions are given for installation with a special acid-proof cement which is as highly resistant to bacteria, extreme heat, chemical and abrasive attacks as the hard fired, red-shale bricks themselves. Easy to flush clean, the bricks are furnished with smooth or non-skid surfaces.
*INFORM-A-GRAM KEY No. C67-V*

**HORIZONTAL HEAVY DUTY WAY MACHINES** are featured in a 4-page circular issued by BAKER BROTHERS, INC., Dept. TD, Toledo 10, Ohio. Their No 3½ x 24 floor type hydraulic feed unit is for adaptation to horizontal way machines and is flexibly designed to allow for use of heads on saddle of specifications to meet the job. It is adaptable to two-way and three-way machines of the horizontal type for such operations as heavy duty drilling, boring, facing, counterboring and hollow milling.
*INFORM-A-GRAM KEY A63-V*

**COLLET CHUCKS** are featured in an illustrated booklet published by the UNIVERSAL ENGINEERING CO., Dept. J, Frankenmuth, Mich. The Universal Floating Collet Chuck is designed especially to operate in a horizontal position in automatic screw machines and turret lathes. It is applicable to drilling, counter boring, reaming, and to any operation where piloting from a lead hole is required.
*INFORM-A-GRAM KEY No. 276-V*

**MILLING MACHINE TOOLS & ACCESSORIES** are illustrated in a new Catalog, No. C10, recently issued by the KEARNEY & TRECKER PRODUCTS CORP., Dept. D, Milwaukee 14, Wis. Its 50 pages contain complete listings and information on arbors, cutters, vises, high speed attachments and their optical center scope for every standard milling machine. The systematic arrangement of the catalog is of particular value in locating information.
*INFORM-A-GRAM KEY No. 592-V*

**MERCURY INTERCHANGEABLE TYPE HOLDERS** which provide fast, accurate marking of metal parts are described in an illustrated leaflet issued by the MERCURY METAL DIE & LETTER CO., INC., Dept. J, 546 E. 16th St., Los Angeles 15, Cal. These holders will quickly and easily number parts and do away entirely with the extremely slow and painstaking procedure of individually selecting and separately using single-character dies for each number on each part. The letters and numbers are hand-cut and not cast into

the blanks. This assures a sharp, deep and long wearing type for perfect impressions on all metal surfaces.
*INFORM-A-GRAM KEY No. 657-V*

**HYDRAULIC CYLINDERS** are presented in Catalog H-40-A released by the TOMKINS-JOHNSON CO., Dept. J, 617 N. Mechanic St., Jackson, Mich. Their T-J Series HB Hydraulic Rotating Cylinders are shown operating chucks for holding crankshafts during the cheek facing and pin turning operations. Dimensions and specifications of Hydraulic Rotating Cyclinders for use up to and including 250 pounds pressure per square inch are included.
*INFORM-A-GRAM KEY No. 151-V*

**CHUCKS & MANDRELS** are featured in Bulletins F-1 and F-2 recently published by the ERICKSON STEEL CO., Dept. DJ, 2309 Hamilton Ave., Cleveland 14, Ohio. These tapping chucks can be made adaptable to all makes of precision or production tapping equipment. In an inverted adaption, the Erickson Precision Collet principle used as a mandrel, expands $\frac{1}{32}$" and provides the same gripping strength and accuracy for holding parts by their interior surfaces for machining to close tolerances.
*INFORM-A-GRAM KEY No. 556-V*

**GROUND-THREAD MILLING CUTTERS,** designed for production shops where both high output and precision work are demanded, are pictorially described in a 4-page bulletin issued by the PIPE MACHINERY CO., Dept. TJ, Cleveland, Ohio. These multiple thread mills are available for cutting all types of threads and will complete the work in a little more than one revolution. These cutters are not carried in stock as each one is built to fit its specific job and machine.
*INFORM-A-GRAM KEY No. 660-V*

**GAGES**—Standard plain and thread plug and ring gages are illustrated in a descriptive 4-page folder released by the MERZ ENGINEERING CO., Dept. J, Indianapolis 7, Ind. A wide range of gages, including concentricity and other highly specialized types adaptable to circular and thread grinding can be built to customer specifications.
*INFORM-A-GRAM KEY No. 720-V*

**HIGH PRESSURE DIE CASTING MACHINES** are the subject of a 4-page illustrated bulletin published by LESTER-PHOENIX INC., Dept. J, 2625 Church Ave., Cleveland, Ohio. Model HHP-1 is a modern, completely self-contained die casting machine designed to make better zinc die castings at lower cost to compete with improved (and cheaper) aluminum and iron castings. Model HHP-1CC is equipped with the Lester cold chamber injection system for the high production at low cost of sound die castings relatively free of porosity, in aluminum, brass and magnesium.
*INFORM-A-GRAM KEY No. 425-V*

**NEW HYDRAULIC STRAIGHTENING PRESSES** are described in Bulletin No. VLI-44, now available from COLONIAL BROACH CO., Dept. J, P. O. Box 37, Harper Station, Detroit 13, Mich. These open side presses

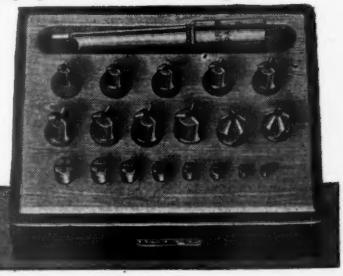
# COUNTERBORE SETS

**Today's war production program demands accurate, efficient cutting tools *within easy reach.* Gairing standard kits provide the answer for counterboring and spotfacing operations. Seven sets from which to choose. Each contains a logical assortment of *interchangeable* counterbores, pilots and holders boxed in sturdy cases.**

**THE GAIRING TOOL CO., Detroit, Michigan**

***For a quarter century specialists in fine cutting tools.***

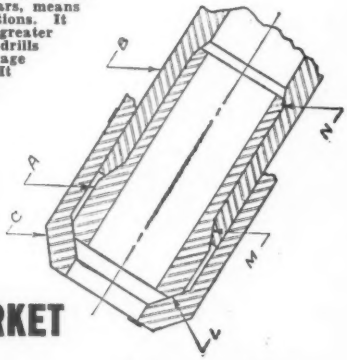
**The set illustrated here consists of one Type A-1 holder, 9 cutters ranging from ¼" to ½", 8 pilots from $\frac{3}{32}$" to ⅜", 2 countersinks ½" dia., 70° and 82°. *Write for catalog and prices.***



# DRILLS LAST LONGER

## FEED FASTER, COST LESS TO USE

The Erickson collet and collet chuck, first revolutionary chucking development in 50 years, means tremendous economies in drilling operations. It delivers more holes per grind, permits greater feeds and speeds, allows cast-off broken drills to be used up, saves up to 50% in breakage costs and up to 50% in set-up time. It gives you superior alignment and gripping power, and delivers a greater guaranteed accuracy than any other chuck.




# No Other

## COLLET CHUCK on the MARKET

**1.** Delivers accuracy of .0005"

**2.** Permits Collet to collapse 1/32"
(Replacing 7 Standard Single Purpose Collets)

**3.** Grips Drills on Flutes, permits stubbing

**4.** Grips tool at 8 points instead of 3

### HOW IT WORKS

Collet A automatically lines up concentrically with axis of Shank B by two cam surfaces of collet M and N mating with cam surfaces of shank. These cam surfaces mate to within .0001" and wear equally. Thus collet aligns with Axis of Shank, and is drawn back by Collet Cam Surface L and Nose Piece C. Collet, open-slotted at both ends, collapses equally along entire length, remains aligned, and grips "like a vise".

Get the full story at no cost on this amazing development. It may mean much to you in the immediate post-war future, as well as to-day. Erickson Collet Chucks are practical everywhere that chucks are used. Remember this, the heart of this revolutionary gripping device is the collet and that chucks can be adapted specially for any problem you may have, if standard chucks are not suitable. Write to-day.

ERICKSON *Means* PRECISION *in* COLLET CHUCKS

## SEND COUPON TODAY

Dept. A of Erickson Steel Co.
2307 Hamilton Ave., Cleveland 14, O.

( ) Supply Catalog A and full information at no cost on Erickson Collet Chucks.

( ) Send Field Engineer to help solve a chucking problem. No obligation.

NAME .....

ADDRESS .....

CITY .....STATE .....

are of reinforced welded steel construction with built-in motors. Rams are operated by direct-acting hydraulic cylinders in the head and are accurately controlled through a light-pressure combination hand control and foot pedal. The bulletin lists standard and extra equipment and gives specifications on models ranging in capacity from 10 tons to 50 tons. *INFORM-A-GRAM KEY No. 26-V*

**AEROMOTORS** are featured in Bulletin 120 available from the DUMORE CO., Dept. DJ, Racine, Wis. These Aeromotors have either series or shunt windings depending upon the requirements of the service. Nearly all intermittent-duty motors have series windings and because of the high starting torque and rapid acceleration this type of motor is best suited for applications having heavy starting loads, such as cowl and oil-cooler flaps and ammunition boosters. *INFORM-A-GRAM KEY No. 561-V*

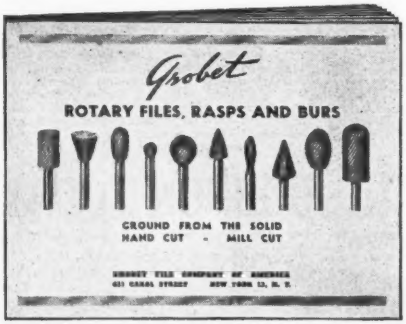
**COLLET INDEX FIXTURES** for toolroom and inspection work are pictorially described in a 4-page bulletin issued by HARDINGE BROTHERS, INC., Dept. DJ, Elmira, N. Y. These fixtures are for direct application or for use with a sub-base on milling machines, grinders, shapers and drill presses. The interchangeability which exists between the various units is shown. The manufacture of duplicate parts requiring indexing operations is an excellent application for these fixtures. *INFORM-A-GRAM KEY No. 582-V*

**UNIVERSAL GRINDER**—The Greenfield No. 4 Tool & Cutter Grinder is illustrated in Bulletin 2 published by the PRODUCTION MACHINE CO., Dept. TD, Greenfield, Mass. It can be furnished either as a plain cutter and reamer grinder or as a universal type with any or all attachments as shown. Standard and additional equipment and accessories for the Greenfield No. 4 Grinder and the No. 4U Universal Grinder are illustrated. *INFORM-A-GRAM KEY No. 105-V*

**HIGH-SPEED ADJUSTABLE WORK CLAMPS** for neatly and safely securing work firmly in place on machine tables is featured in a bulletin published by the HOWELL CLAMP CO., Dept. D, 1373 E. 95th St., Cleveland 6, Ohio. Available in three sizes for light, medium and heavy duty work, Howell clamps are positive in action and easily adjustable for pieces having a wide variety of shapes and sizes. They make accurate and speedy setups a simple matter for any mechanic. *INFORM-A-GRAM KEY No. C66-V*

**PRECISE 35**—This super-speed electric handtool, cased fully in durable, lightweight plastic is fully described and illustrated in a 4-page folder issued by PRECISE PRODUCTS


**SEND FOR NEW CATALOG YR**

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***(Please make your request for "Catalog YR" on your firm letterhead)***

**GROBET FILE CO. of AMERICA**

**421 Canal Street** — 1812 F. L. GROBET — **New York 13, N. Y.**

**IMPORTERS OF GROBET SWISS FILES** — **MFRS. OF GROBET ROTARY FILES**

**PLANTS: NEW YORK, CHICAGO, LOS ANGELES**

Rockford Hy-Draulic SLOTTER
Rockford Hy-Draulic OPENSIDE SHAPER
Rockford Hy-Draulic SHAPER
Meet the "Heads"
of a Famous Family
Rockford Hy-Draulic OPENSIDE PLANER
Rockford Hy-Draulic SHAPER PLANER
All these "heads" have one important factor in common. Each shows a means of using hydraulic power for smooth, precise, rapid cutting of metal. These are the heads of various Rockford Hy-Draulic machine tools.
When you seek machine tools for economical and profitable operation in a competitive world, investigate the advantages of Rockford Hy-Draulic Shapers, Planers, Slotters and Shaper-Planers. Easy, fast operation; and exact combinations of speed and feed for maximum production are two of many features in Hy-Draulic design which cut costs and increase production.
Bulletins are available describing the following Rockford Hy-Draulic machine tools: Shaper—12" stroke; Shapers—16" to 28" stroke; Openside Shaper—36" stroke; Planers, Openside and Double Housing, up to 60" x 60" and 20-foot stroke; Slotters—12", 20", or 36" stroke; Shaper-Planers 42" to 144" stroke.
Copies of any and all bulletins will be sent without charge or obligation. Please address Dept. 2501.
ROCKFORD MACHINE TOOL COMPANY
ROCKFORD ILLINOIS
Rockford Hy-Draulic DOUBLE HOUSING PLANER
FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS
SHAPERS
PLANERS
Hy-Draulic
SLOTTERS
SHAPER-PLANERS

CO., Dept. T, 1328 Clark St., Racine 3, Wis. This versatile tool which weighs only 35 ounces turns over 35,000 rpm and delivers a full 1/6 hp at the spindle. It can be used for grinding, routing and cutting operations on steel, nonferrous metals, plastics and glass.
*INFORM-A-GRAM KEY No. B21-V*

**MINIATURE BOOKLET FEATURES 12 PRODUCTS** manufactured by the CLARK EQUIPMENT CO., Dept. TD, Buchanan, Mich. Its 32 colored pages pictorially describe Clark Celfor Drills and Reamers, Electric Steel Castings, Metal Spoke Wheels, Front and Rear Axles for trucks and buses, transmissions, Gear and Forgings, Fork Trucks and Industrial Tractors, Railway Car Trucks, Blind Rivets, Trailer Axle, and the newly developed Booster Engine for 1½-ton trucks.
*INFORM-A-GRAM KEY No. C2-V*

**FLASHLIGHT STORAGE BATTERY**—A great deal of technical and semi-technical information on their rechargeable wet storage battery for flashlights and the methods for recharging it is contained in Bulletin 61 recently published by the B. F. GOODRICH CO., Dept. TD, Akron, Ohio. The bulletin recommends charging procedures and gives much useful information on the care of the battery and its rechargers.
*INFORM-A-GRAM KEY No. A4-V*

**FABRICATED TUBE PARTS**—The diverse operations employed in fabricating tubular parts from seamless copper, brass, and aluminum tubing are described in a very comprehensive brochure recently issued by the Wolverine Tube Division of CALUMET & HECLA CONSOLIDATED COPPER CO., Dept. T, 1411 Central Ave., Detroit 9, Mich. It is profusely illustrated and carries many charts and tables which will prove useful to any designer having tubing applications.
*INFORM-A-GRAM KEY No. 19-V*

**HISTORY OF POWER APPLICATION**—A highly interesting booklet entitled "From the Shadoof to the Dominant Drive" has recently been published by The Multiple V-Belt Drive Association, 140 S. Dearborn Street, Chicago 3, Illinois.

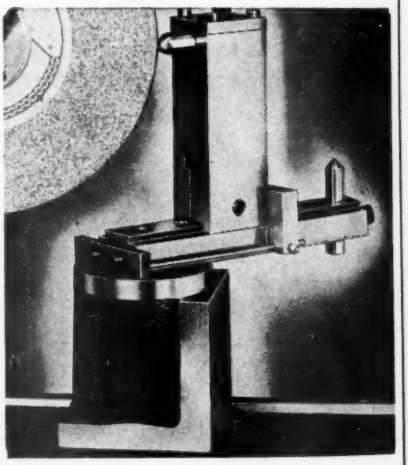
This 48-page, illustrated booklet, a thumb nail history of man's effort to transmit power for his own benefit is available to those interested.

Progress of the application of power transmission is clearly developed from such early tools as the lever, inclined plane, wedge, and pulley or wheel to the present day use of the multiple V-Belt drive. Readers will find this subject well presented and the booklet good source of basic information about the historical development of the application of power.
*INFORM-A-GRAM KEY No. 405-V*


# THE "FORM-MASTER"

## ANGLE & RADIUS DRESSER

**A sturdy, quality instrument designed by form-grinding specialists to dress both angles and radius at low cost. Two 1/3 ct. diamonds and instrument case included—$150.00 complete.**

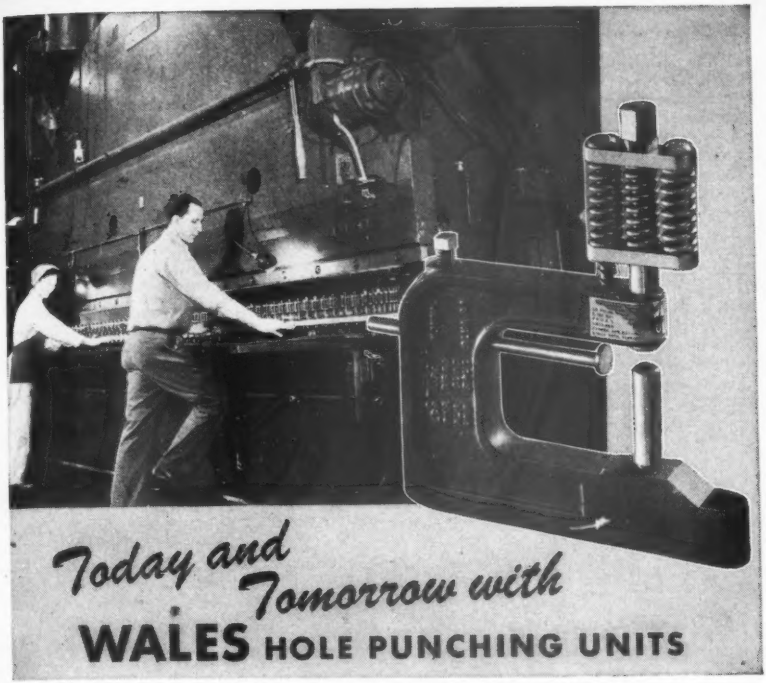


*Features*

**Large range.**
**Chatterless and dustproof.**
**.0001" accuracy obtainable.**
**Simple to operate.**
**Reasonably priced.**

***Call your supplier or write***

**J. & S. TOOL CO.**
**477 MAIN ST. E. ORANGE 4, N. J.**




An impressive setup of over 150 Wales Hole Punching Units in a press brake at Boeing Aircraft Company, Seattle, Washington

**TIME-SAVING, MONEY-SAVING FEATURES**

1. Usual time-consuming adjustments of conventional set-ups are elimnated.
2. Punch and die held in perfect alignment by holder.
3. Each unit is independent and self-contained.
4. Straight line, staggered and scattered patterns punched with same units.
5. Same group of units may be used interchangeably on press brakes and stamping presses.
6. Nothing is attached to press ram.
7. Individual units may be instantly removed or reset.
8. Punches may be interchanged without disturbing setup.
9. Die setting and press "down time" reduced to minutes.
10. Same units may be used and reused in unlimited patterns.

**TODAY Wales Hole Punching Units are helping to turn out war material faster and *faster and faster.***

**TOMORROW these units will be aiding in producing civilian metal products in greater quantities and at greatly reduced costs because of the many patented features at the left.**

**Get acquainted with how Wales Hole Punching Units fit into your post-war production setup *by writing for completely illustrated catalog today.***

**WALES-STRIPPIT CORPORATION**
**345 Payne Ave. North Tonawanda, N. Y.**
**(Between Buffalo and Niagara Falls)**
**GEORGE F. WALES, President**

**"FIFTY YEARS OF FINER PLATING"** published by PHILIP SIEVERING, INC., Dept. T, 199 LaFayette St., New York, N. Y., describes their many services in the plating field including "Alzak" the plating for producing a non-tarnishable mirror-like finish on aluminum, and "Metallizing" a special process of imparting a metallic surface finish to glass, hard rubber, plaster of Paris and plastics of all kinds. Also featured are several other exclusive plating finishes such as Alumilite, Bright Nickel, Korolac, Rhodium plating and the plating of all metals on aluminum. The booklet describes the Sievering Technical Service and Experimental Laboratory for advisory work on new products and finishes. The specifications for Electroplating of Nickel, Chromium, Zinc and Cadmium on steel are very helpful in determining the plating thickness for general and mild service applications.
*INFORM-A-GRAM KEY No. C65-V*

**MULTIPLE PUNCHES & SPACING TABLES**—Two new bulletins presenting the latest improved lines of multiple punches and spacing tables and describing their operations, are announced by Thomas Machine Manufacturing Co., Pittsburgh 23, Pa.

Bulletin 306, entitled "Thomas Multiple Punches and Spacing Tables" contains 25 large illustrations in its 16 pages with condensed descriptions of multiple punches and tables. Tool set-ups for punching plates and shapes on a number of these machines are pictured.

The spacing tables illustrated include the completely automatic, semi-automatic, hand-operated and indicator types.

Punches in six sizes, from 150 tons to 1,000 tons, designed for punching plates and all classes of structural material, are shown, together with spacing tables designed for a variety of applications in the railroad car shop, structural shop and similar industries. A table of punching capacities is given.

The companion Bulletin, 306A, entitled "The Thomas Spacing Table in the Structural Shop", and comprising four pages with five illustrations, describes the mechanics of the spacing table acting with multiple punch. Methods of operation for various purposes are thoroughly discussed, as well as the advantages that are obtained over hand layout and punching.
*INFORM-A-GRAM KEY No. 994-V*

**WELDING CURRENT HEAT CONTROL**—A technical Bulletin, No. WTH-44, containing descriptions, applications, specifications, and features of the new improved line of Weltronic "package unit" Heat Controls—which provide dial-controlled, infinitely variable, phase-shift regulation of the welding current—has been released by the WELTRONIC CO., Dept. T, 19500 W. Eight Mile Rd., Detroit 19, Mich. Models are now available for resistance-welding processes including spot, seam, pulsation, butt, flash, and forge welding.
*INFORM-A-GRAM KEY No. 931-V*

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REID SURFACE GRINDERS are of heavy, rigid *stress-proof construction* for smoother work finish.

ACCURACY
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DURABILITY
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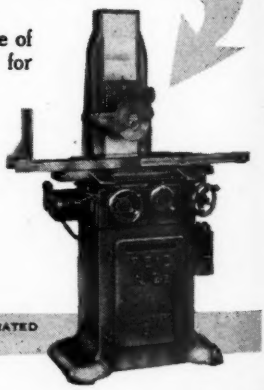

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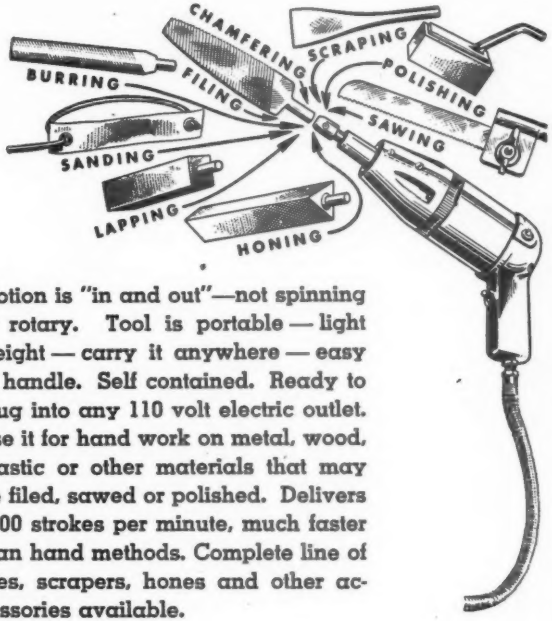
Reciprocating Action (In and Out)

# PORTABLE *Electric* H & H TOOL




**Motion is "in and out"—not spinning or rotary. Tool is portable — light weight — carry it anywhere — easy to handle. Self contained. Ready to plug into any 110 volt electric outlet. Use it for hand work on metal, wood, plastic or other materials that may be filed, sawed or polished. Delivers 1000 strokes per minute, much faster than hand methods. Complete line of files, scrapers, hones and other accessories available.**

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## *Acme Tool Company*

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*Easy, Safe & Quick*
Die Handling
with
LYON-Raymond
*Hydraulic*
ELEVATING TABLES

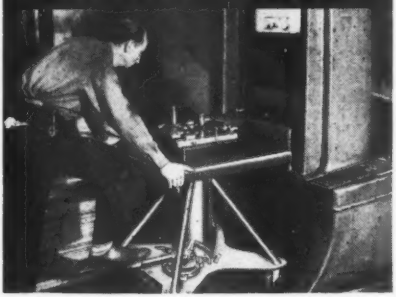


Table with die is maneuvered up against the press and operator elevates load with hydraulic foot pump.

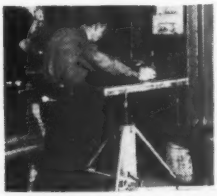
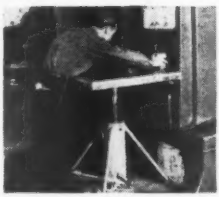


Table is brought to exact level of press bed. Floor lock, depressed, holds caster-equipped table securely in position.

Die is slid onto press bed and positioned under ram. One man often does the work of two or three.



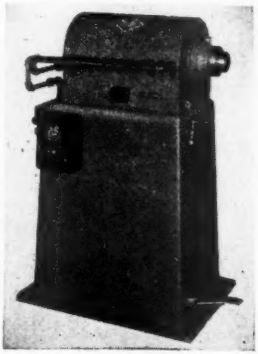
Transfer of dies from press to storage rack the LYON-Raymond way protects the die from damage, increases shop safety, saves manpower. Learn how others are using this lathe. Write for Bulletin.

LYON-Raymond
Corporation
410 Madison St. Greene, N. Y.


## Variable-Speed Lathe

The Schauer Machine Company, 2076 Reading Road, Cincinnati 2, Ohio, announces a new variable-speed Speed Lathe.

Single foot-pedal control of full work cycle is one of the unusual features of this air-operated, heavy duty lathe. Another is the application of air operation to the work spindle, which has a 1" hole



for handling rod or bar stock or long work pieces. The lathe will handle work up to 1⅜" maximum collet capacity. Step chucks, expanding mandrels or special work holding fixtures can also be used thereby making this a most versatile machine.

Depressing the foot pedal closes the collet, releases the brake and connects the motor to the work spindle thru a Twin-Disc clutch assembly. The motor runs continuously. The air line is provided with a control valve which permits a time lag before the collet releases the work.

Variations in speed are obtained by using a Reeves drive, operated by a speed control handle within easy reach of the operator. Speeds from 100 rpm to 4800 rpm can be selected. This new variable-speed lathe is designed for performing operations such as secondary finishing, polishing, de-burring, filing or lapping of metal and plastic parts.

*(When requesting information, please use postage-free Inform-a-gram card on page 146-A)*

*INFORM-A-GRAM KEY No. 129-V*

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# PRICE REDUCTION

*on finest precision hand-scraped*

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***Proportionate Reductions on Precision Angle Irons, Parallels, Straight Edges, V Blocks and other Inspection Equipment***

As our contribution to lowered costs in the coming reconversion period, we announce a 40% reduction on our fine precision, hand-scraped surface plates, with proportionate reductions on Angle Irons, Parallels, Straight Edges, V Blocks and other fine precision inspection equipment.

These price reductions are made at no sacrifice in quality. Every Lombard surface plate will still have all the Lombard hall-marks of quality, scientifically heat-treated in our plant and precision hand-scraped.

Thousands of Lombard plates are now giving satisfactory use in leading aircraft and engine plants and in tool and die shops all over the United States. The surface plates you order at these new prices will be the equal of these plates in every respect. Back of every Lombard product stands a half century reputation for building fine precision machinery.

Write for catalog and prices indicating sizes in which you are interested. Prompt delivery.

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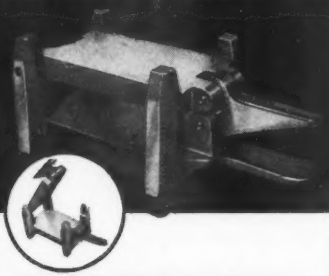

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**WITH LESS MAN HOURS**

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- *Saves Tool Makers' Time*
- *Saves Production Time*

**STANDARDIZE AND STOCK UNIVERSAL'S DRILL JIGS**

**ADJUSTABLE DRILL JIGS**

*Models from $19.25 to $31.75 Immediate delivery*

Box Type Jig in six sizes – Jig Frame and Cover finished top, bottom, and both sides. Base also finished.

To make ready, locate part on base, add side plates if drilling sides, install bushings and clamps. No wasted time and fast operating.

*. . . Master Layouts giving exact specifications on request . . .*

Round Stock Jig in three sizes.– Will handle from ¼″ to 2″ Stock.

To make ready, add bushings, set equalizing clamp by lock nuts, and adjust stop.

**Universal's Jigs are being used by hundreds of manufacturers.**

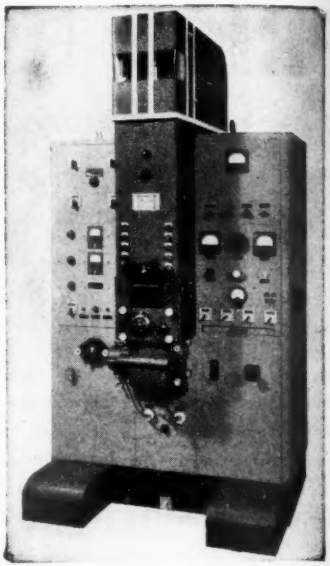
**UNIVERSAL TOOL CO.**

919 E. Redondo Blvd., Inglewood, Calif.


## Electronic Oscillograph

A new self-contained industrial oscillograph which records characteristics of electrical phenomena lasting less than a millionth of a second is announced by Westinghouse Electric Company, Pittsburgh 30, Pa.

The unit consists of the oscillograph proper and the cabinet housing all energizing and control circuits. Energizing terminals are enclosed except one bush-



ing connected to the source of synchronizing impulse. Deflecting coils position the beam to use the whole area of the film for the record.

In addition to the screen for direct reading, the instrument contains a stationary standard film holder for recording electrical phenomena lasting 1/1000 of a second or less, and may be operated with a rotating film drum for phenomena lasting from 1/1000 to 1/10 of a second.

The electronic oscillograph will record an electrical transient with respect to time or two electrical phenomena such as voltage versus current in respect to each other.

*INFORM-A-GRAM KEY No. 35.5-V*

# HALCO

## UNIVERSAL HIGH-SPEED MILLING HEAD

**FOR MILLING, DRILLING, BORING, COUNTERBORING, AND FLY-CUTTING AT ANY ANGLE.**

**Insures greater rigidity, closer tolerances, and longer life.**

**Has micrometer readings in .001 graduations.**

**Gib adjustable to compensate for wear.**

**FEATURING FEED THRU THE DOVE TAIL SLIDE BLOCK**

***Other important Halco features are these:***

**No. 3 Morse taper precision ground spindle capable of taking ¾" collet.**

**Timken taper bearings.**

**Heavy overarm clamp adjustable to any compound angle.**

**Total indicated spindle runout .0003.**

**Delivery from stock on AA-1 MRO priority—No. 3 Morse taper collets from ¼" to ¾" in 1/16ths also from stock**

**Guaranteed against mechanical failures for six months.**

**We also manufacture the Brown & Sharpe type floating tool holders for automatic and hand screw machines.**

**B-5—Five Speed Model, Speeds Ranging from 350 RPM to 3000 RPM.**

**B-10—Ten Speed Back Gear Model, Speeds Ranging from 125 RPM to 5000 RPM.**

**New York Representative: Aaron Machine Co., 45 Crosby St., New York, N. Y.**

## MANUFACTURING AJAX CORPORATION

*Manufacturers of Milling Attachments*

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is a series of manuals being prepared by specialists having the practical, shop know-how in their respective fields. Metal working processes, techniques and materials (including plastics) will be treated comprehensively and authoritatively. A number of "Know-Hows" are in preparation and the first two now available are:

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● The following informative articles, in attractive pamphlet form, are all valuable for men engaged in tooling and production shop practices. Let them help you with your problem.

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**BULLET TOOLING PROGRAM**—This article on Production Tools for the Manufacture of Small Arms Ammunition covers design, finishing, heat treatment, and a chart on equipment and operations required in manufacturing caliber .30 to 40 mm cartridge cases.

**CONTOUR MACHINING TECHNIQUE**—Most of the many illustrations used give details on correct saw tracking, technique for cutting various angles, operating speeds, internal sawing procedure.

**FLAME-HARDENING STEEL DIES**—Presents technical information on this unique development for longer die life.

**INFRA-RED IN INDUSTRY**—This excellent treatise discusses, among other things, the combined use of freezing units and infra-red heating systems. Complete with tables and text.

**INSPECTION TECHNIQUE**—Covers inspection methods, equipment. Tolerance control of manufacture is explained with charts depicting bilateral and unilateral tolerances.

**METALLIZING IS SAVING VITAL WAR MATERIALS**—Provides data on available processes and their application. Also, details on the preparation of the part for metallizing.

**PLANER AND SHAPER TECHNIQUE**—Sixteen pages of text and tables covering planing, shaping and slotting processes. Includes work holding fixtures, tool grinding, cutting speeds and feeds.

**PRACTICAL POINTS IN MOLD DESIGN AND CONSTRUCTION**—149 pointers on general mold design, compression and injection molds. Valuable for finisher and inspector.

**SURFACE FINISH INSPECTION ON THE BRUSH SURFACE ANALYZER**—Removes all mystery from the entire subject of surface finish inspection.

**THREAD GRINDING TECHNIQUE**—Illustrated treatise covering wheel and work speeds; depths of cut and proper choice of wheel grades. Valuable training aid explaining thread grinding machines and methods.

**THREADING TECHNIQUE**—Points out to tooling and production men how to obtain longer tap use. Gives tap and thread terms, types of taps and machines, checked list of trouble sources, etc.

**WELDING TECHNIQUE**—Detailed, illustrated discussion on arc, carbon arc, metallic arc and shielded arc welding.

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**TECHNICAL DIGEST OF VIBRATION STUDY**—An 8-page reprint of a technical paper entitled "The Vibration Characteristics of 'Free-Free' Circularly Curved Bars" is available from The Cooper-Bessemer Corp., Diesel engine, gas engine and compressor builders Reporting the outcome of an extensive study, the paper is considered a valuable contribution to engineering in connection with the behavior and design of piston rings.

Taken from the publication, "Journal of Applied Physics", the material was prepared and written under the direction of W. A. Pliskin and J. E. Edwards of Ohio University, and F. P. Bundy, Harvard University, with the collaboration of engineering officials of The Cooper-Bessemer Corporation whose interest in the preparation of the data also included the furnishing of accurately machined ring specimens used in various tests upon which the paper was based.

The discussion deals with the experiments conducted to determine certain vibration characteristics, the results of which furnish data that make it possible to calculate with reasonable accuracy, the frequency of vibration, parallel or transverse, of any incomplete, free-free, circularly curved bar of uniform cross section where its mechanical constants are known.

Reprinted on a good grade of paper and liberally illustrated, copies are available by writing to The Cooper-Bessemer Corporation, Dept. J, Mount Vernon, Ohio.
*INFORM-A-GRAM KEY No. 85.5-V*

**PRODUCTION TAPPING MANUAL**—"Guide for Production Tapping", a 12-page booklet issued by the Cleveland Tapping Machine Co., Dept. T, 1725 Superior Ave., Cleveland, Ohio, is available without charge in reasonable quantities. It is composed of various useful data, not previously compiled, relating to automatic tapping as performed on lead screw tapping machines.

It contains suggested tapping speeds in all materials, including various alloys of steel; suitable lubricants for all materials; table of spindle speeds; table showing number of pieces possible per hour on production runs; and a table of basic thread dimensions and tap drill sizes.
*INFORM-A-GRAM KEY No. 242-V*

**THE ANNEALING OF STEEL** by Peter Payson, Chief Research Metallurgist, Eastern Research Laboratory, Crucible Steel Co. of America. Published by the Crucible Steel Co. of America, Dept. TJ, 405 Lexington Ave., New York 20, N. Y., and priced at one dollar, this treatise sets forth steel annealing principles that are covered by Patents issued to the author and assigned to the company. Because the procedures described may be of use in the war production program, the principles have been made available by the company to anyone wishing to utilize them.

Indicative of the comprehensive content are the several chapter titles: Statement of Principles; Construction of Transformation-Temperature-Time Curves; Correlation Between Transformation During Continuous Cooling and Transformation at Constant Temperatures; Annealing Cycles Based on TTT Curves; Miscellaneous Factors which Control Microstructures of Annealed Steels; and Summary. All told, 60 pages (with illustrations, charts and photomicrographs) of vital steel treating information. Extensive bibliographic references tie this work in to prior and current research. The author has tried to make it clear that annealing can be made most efficient when the transformation behaviors on steels are understood, and when this knowledge is applied in every annealing operation. The basic principles are relatively few, and they can be demonstrated readily in the laboratory. However, the conversion of laboratory practice to production annealing may not

always be easy, especially when large furnaces are used. Many of the difficulties involved can be overcome by diligent study of this highly commendable text.

**MILLING STEEL WITH CARBIDES**—A 14-page, illustrated technical Bulletin No. GT-174 containing detailed information on the high speed milling of steel with cemented carbide tipped cutters is offered by Carboloy Company, Inc., Dept. T, 11109 E. 8 Mile Ave., Detroit 32, Mich. It is not necessary to specially design every carbide cutter used for steel milling, according to the manual. In fact, it frequently may be found that general purpose carbide milling cutters either will meet the exact requirements or else be so close that the minor departure from optimum performance will be more than compensated for by the greater ease with which such general purpose cutters can be obtained and the greater economies effected in tool costs.

However, all factors which must be considered by the tool user or designer when designing a carbide cutter for those jobs where optimum cutter performance justifies individual tool design are treated in detail in the bulletin. Speed, feed, chip space, number of teeth and power available, etc., are covered. The nomenclature used in the booklet to designate the various angles is made clear with text and diagrams, and the importance of negative cutting angles is stressed.

The material in this manual is all based on practical field work together with observations of many jobs in almost every branch of the metal working industry, making it a useful guide for handling nearly every type of milling job using carbides. By following the principles set forth, the task of designing satisfactory carbide-tipped cutters for milling steel—and using them efficiently—will be found to be greatly simplified.
*INFORM-A-GRAM KEY No. 82.5-V*

**GRAY IRON CASTINGS PRICE REGULATION**—Prepared and distributed to industry members by the Gray Iron Castings Industry Advisory Committee to the Office of Price Administration and the Gray Iron Founders' Society, Inc., a booklet, "The ABC's of Maximum Price Regulation No. 244," is intended to clarify that regulation. While the text has not been officially approved by OPA, it has been read by OPA staff members and their suggestions have been incorporated.

Subject matter is presented in two parts. Part 1 contains a series of questions and answers intended to interpret the Regulation in simple language. Following each answer reference is made to the section number of Maximum Price Regulation No. 244 which is reproduced in Part 11 of this booklet. The regulation, as reproduced, includes Amendments 1 to 7; Amendments No. 8 and 9 follow in order. As additional amendments are issued by the OPA supplementary pages will be prepared and distributed to the Gray Iron Castings Industry for insertion in "The ABC's of Maximum Price Regulation No. 244-Gray Iron Castings."

For the sake of completeness and for the convenience of those who propose to apply for relief, an appendix gives facsimiles of the new OPA relief forms and a copy of "Supplementary Order 28", which describes the procedure for seeking price adjustment based upon a wage or salary increase. Headquarters for the Gray Iron Founders' Society, Inc., is at 1201 Nineteenth St. N. W., Washington, D. C.

**THE CASTING PROPERTIES OF BERYLLIUM-COPPER** are discussed in a new 14-page booklet published by THE BERYLLIUM CORPORATION OF PENNSYLVANIA, Reading, Pa. This booklet should be of considerable interest to metal workers as technical information on the casting properties of beryllium-copper alloys has not heretofore been published. Industry has known and used beryllium in its wrought form for a number of years and will be much interested to learn of its value as a casting alloy.

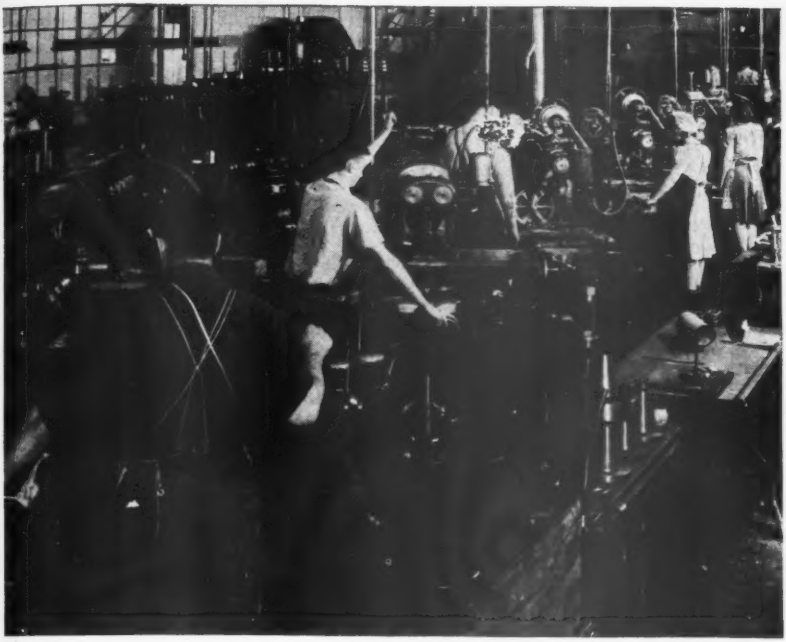
This publication is freely illustrated and gives information on the physical properties of beryllium-copper alloys; recommendations on heat treatment; machining practice; and describes some parts that have been made of beryllium-copper during the past year where no other alloy was satisfactory.
*INFORM-A-GRAM KEY No. C72-V*

**HUNTER SPRING DATA BOOK**—a comprehensive manual published recently by HUNTER PRESSED STEEL CO., Lansdale, Pa., will be of interest to engineers and designers.

This book contains essential and fundamental information about compression, extension, and torsion springs, requirements for their design and numerous charts, tables and formulas. A procedure is also given for the calculation of springs. Some of this material has never been published before in this form.

The Hunter Spring Data Book should prove an extremely valuable and convenient source of information on springs, metal stampings and wire forms.
*INFORM-A-GRAM No. 325-V*

**MULTIPLE SPINDLE DRILLHEADS** are described in a 16-page illustrated brochure issued by the Thriftmaster Products Div. of ZIMMER-THOMSON CORP., Dept. T, 29-05 Review Ave., Long Island City 1, N. Y. A variety of drillheads is shown along with cutaway views of both drillheads and their accessory equipment. A new spindle of unique design, permitting very close and simple depth adjustments in .0015" increments, is featured.
*INFORM-A-GRAM KEY No. C45-V*



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**Although the extra production demands now being made on our old and regular customers are in turn felt by us, so that we are "operating on a pretty full schedule" most of the time; we still feel the same zest for meeting the challenge of new production problems brought by new customers.**

**We invite you to discuss your requirements with us.**

*Designers and Manufacturers*

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**"SALT BATH QUENCHING PROCESSES"**, a booklet prepared by Harold J. Babcock, Research Engineer, Ajax Electric Co., Philadelphia, Pa., is available on request from the AJAX ELECTRIC CO., Frankford Ave., at Delaware Ave., Philadelphia 23, Pa.

Isothermal quenching and its applications have aroused considerable interest among men who are concerned with heat treating. Mr. Babcock's paper is among the latest contributions to this revolutionary heat treating process. His article explains the basic principles underlying the concept of "isothermal transformation"; describes the practical processes (martempering, austempering and cyclic annealing) that utilize it; and cites several outstanding applications of salt bath quenches that have resulted in improved heat treatment of various war products.
*INFORM-A-GRAM No. 68-V*

**TOOL GRINDING CHART.** The Ingersoll Milling Machine Company, Rockford, Ill., is offering a toolroom wall chart graphically depicting the proper methods for grinding milling machine cutters. The chart is subdivided, in part, into nine panels of line drawings showing the basic, standard cutter grinds for the rough and finish milling of cast iron; the rough and finish milling of steel; the rough and finish milling of aluminum; and the proper grind for helical slab milling cutters. Also protrayed are the basic grinds for Ingersoll's "shear clear" cutters as applicable also to cast iron, steel and aluminum. Brief instructional text and cutter photos add to the utility of the chart in attaining better grinds and longer cutter life. Its 15" by 23" size results in high visibility and makes it most suitable for framing and mounting handy to the grinder men.
*INFORM-A-GRAM KEY No. C70-V*

**A RESISTANCE WELDING CONTROL TRAINING COURSE** has been prepared by Westinghouse. The course is designed to set forth in a clear and understandable manner how welding processes differ, how electric control for resistance welding works, and how this method of control extensively adapts this welding process to industry.

This training course was primarily prepared for Westinghouse employees but because of many requests from interested parties in resistance welding control, the complete material of the course has been made available to others at reproduction cost. The course is in seven parts and utilizes slide and sound films, lesson books, quiz books and an instructor's manual.

Subjects covered by the course are: (1) Basic definitions of Welding: Gas Welding;


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made to precision standards for instruments, dies and tools—specify GIBSON, product of 75 years specialized experience. Scientifically designed for the work they are to do, made to exact specifications, heat treated and thoroughly tested, they function more accurately, last longer, save time in assembly and adjusment, reduce spoilage, cut costs all around. Investigate! Write us about your requirements.

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Accuracy to thousandths . . . . . Yes, even millionths. Our complete inspection laboratory is scientifically air-controlled. The elimination of temperature variations assures positive accuracy to your specification.

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Thermit Welding; Electric Arc Welding; Resistance Welding. (2) Types of Resistance Welding Work: Spot; Projection; Seam; Butt; Flash; Duty Cycle. (3) The Ignitron and the Thyratron: Fundamentals of Electronic Tubes; Ignitron; Thyratron. (4) How the Flow of Resistance Welding Current is Started and Stopped. (5) How the Amount of Resistance Welding Current is Controlled; Phase Shift Heat Control. (6) Electronic Timing Controls in Resistance Welding: Basic Principles of Electronic Timing; Synchronous-Precision Weld Timer; Sequence-Weld Timer. (7) Energy-Storage Control: Capacitor-Discharge Type; Magnetic Type.

Further information may be obtained by addressing C. R. Riker, Extension Training, Westinghouse Electric and Manufacturing Co., 306 Fourth Ave., Room 1712, Pittsburgh 30, Pa.

*INFORM-A-GRAM KEY No. 35-V*

**"TOOL STEEL FOR THE NON-METALLURGIST"** has been published by the Crucible Steel Company of America for those interested in becoming familiar with their various analyses of tool steels and with the performance the different steels can be expected to offer. Thirty pages of useful information on the heat treatment, testing and applications of tool steels and die steels make this an exceptionally valuable manual for students and toolroom apprentices. Write Crucible Steel Company of America, 405 Lexington Ave., New York, N. Y., for your copy of this excellent handbook.

*INFORM-A-GRAM KEY No. 256-V*

**"THE HOW AND WHY OF STORAGE BATTERY WELDING"** is published by the Progressive Welder Company, 3050 E. Outer Drive, Detroit 12, Michigan, for those interested in adding to or increasing the welding operations within their organization. The theory and use of storage battery welding is completely presented and the maintenance and servicing of the welding equipment is fully covered. When considering equipment for the welding of any material that is capable of being welded by the high-resistance method, this booklet will be found most helpful.

*INFORM-A-GRAM KEY No. 146-V*

**FABRICATION OF STAINLESS STEELS**—The Allegheny Ludlum Steel Corporation, Brackenridge, Pa., has recently published a manual entitled "Fabrication of Allegheny Stainless Steels". This publication contains valuable reference material for fabricators using stainless steel.


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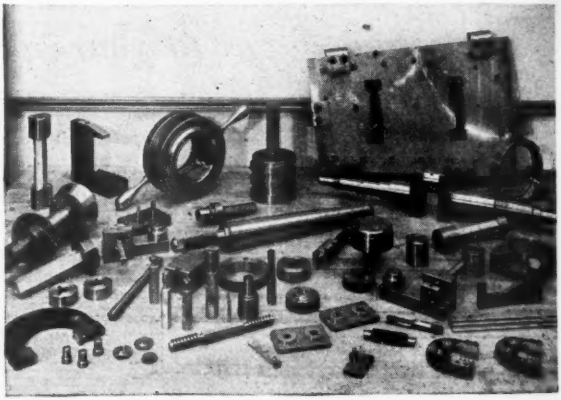

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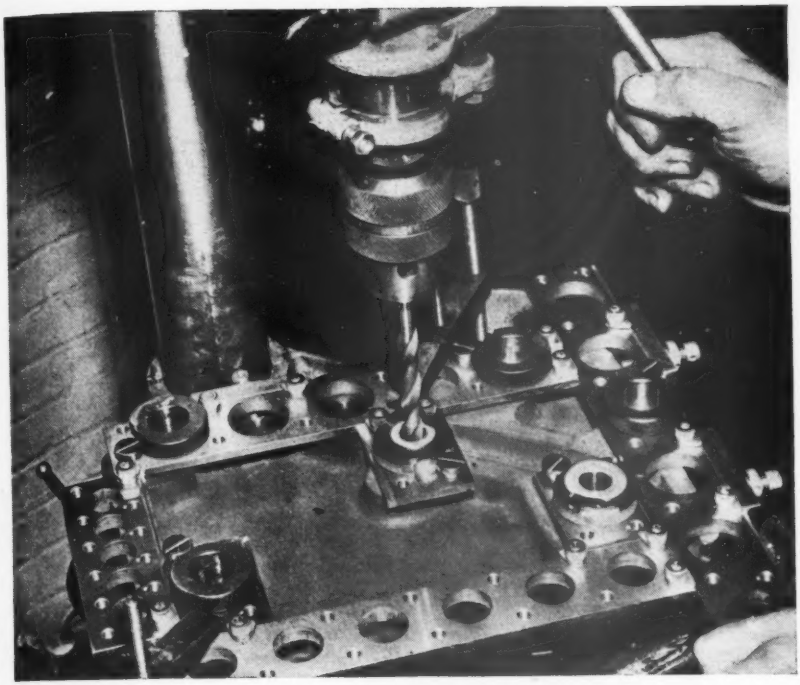

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The new precision tool of a thousand uses! Our MICRO-KING BORLOCATOR can be set up quickly as a "prefabricated" drill jig, for example, saving skilled time required to make expensive drill jig plates, and eliminating delay. When runs are completed, the BORLOCATOR can be dis-assembled and set up on a new job—no wasteful storage and marking of fixtures for possible future use.

Although adaptable for circular, polygonal and box jigs as well as flat setups, the BORLOCATOR is set firmly and precisely by means of specially developed compression-type clamps and screws which obviate lateral shifting of parts. A few of its many applications are as internal and external inspection gages, masterplates for coordinating drill jigs, temporary jigs, and as a perforating fixture for metal and plastics materials.

***Send for our descriptive broadside giving additional BORLOCATOR uses, many of which will fit into your production cycle.***

**STEEL TOOLS, INC** • 2307 Prospect Avenue Cleveland 15, Ohio

Phone: CHerry 1347

Its 27 pages are file size, perforated and include helpful tables. Application information covers the welding of the stainless alloys by metallic arc, acetylene, atomic hydrogen and electrical resistance welding. Also covered in detail are the techniques of drawing and blanking, machining, spinning, upsetting and forging, riveting, shearing, soldering and brazing, annealing and heat treatment, grinding, polishing and buffing and surface treatment.

Copies of this practical work guide may be obtained by writing to the Allegheny Ludlum Steel Corporation, Dept. TD-33, Brackenridge Pa.

*INFORM-A-GRAM KEY No. 678-V*

**DRILLING HARDENED STEEL** is described and illustrated in a "Hardsteel" catalogue and shop manual of 24 illustrated pages recently published by the BLACK DRILL CO., a division of Black Industries, 1400 E. 222nd St., Cleveland 17, Ohio.

Without special tools or fixtures "Hardsteel" tools make it possible to drill, counterbore or countersink hardened steel, eliminating the necessity of annealing before drilling.

This book contains revised tables of recommended drilling speeds, drilling procedure, hardness conversion tables, cutting speeds and feeds table, and a chart showing effect of hardness on cutting speeds as well as the use of cutting fluids, use of lead holes, instructions in grinding and amplified instructions on the correct procedure for wet and dry drilling.

*INFORM-A-GRAM KEY No. 588-V*

**TOOLING FOR BETTER INTERNAL GRINDING** is a full-color Kodachrome sound film thoroughly covering many of the problems encountered in the toolroom and in mass production. Not a primary training film, "Tooling for Better Internal Grinding", is an instructional film designed to answer many questions brought up by plant engineers, tool and fixture designers, grinding room foremen, operators and production men.

It demonstrates the importance of universal tooling for small lot production, standard tooling adapted to production work, and special tooling to enable combining several operations in one chucking. It also shows both plunge and traverse methods of irregular contour grinding (with many cutaway views etc.).

Projection time of Tooling for "Better Internal Grinding" is 40 minutes. These "1600 feet of facts" have been prepared by the BRYANT CHUCKING GRINDER CO. of Springfield, Vermont, and may be borrowed by technical clubs and engineering societies free of


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THE HAMMOND CARBIDE TOOL GRINDER LINE IS COMPLETE — A MODEL FOR EVERY NEED — EITHER WET or DRY OPERATION

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For all single point tools up to 1" shank.

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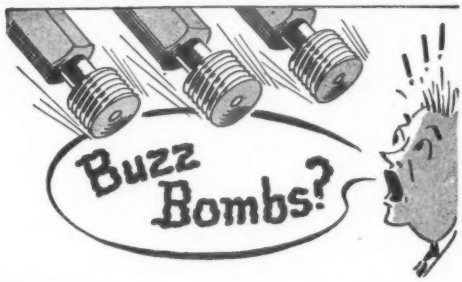

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Acme offers two complete bushing standards, the A.S.A., *plus* the Acme standard line. Because of this you may be enabled to eliminate many special bushing requirements to save time and money.

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charge upon application for a reservation.
*INFORM-A-GRAM KEY No. C71-V*

**"FASTENERS" VOLUME I, NUMBER 3**—An interesting new 19-page illustrated booklet in color has recently been published by the AMERICAN INSTITUTE OF BOLT, NUT AND RIVET MANUFACTURERS, 1550 Hanna Bldg., Cleveland 15, Ohio.

This booklet contains several articles of interest and usefulness to engineers and designers using fasteners in their products as well as information for members of the fastener industry.

Important subjects covered in this publication are the application of screw threads for high temperature bolting, complete with tables covering such applications. There are other articles on standardization progress in the industry and on applications of fasteners to various products.
*INFORM-A-GRAM KEY No. A15-V*

**TECHNICAL BOOKS** are listed in a new catalog just issued by The Chemical Publishing Co., Inc., Dept. T, 26 Court St., Brooklyn 2, N. Y. The latest books on chemistry, technology, physics, general science, mathematics, engineering, foods, formularies, drugs and cosmetics, gardening, medicine, metals, technical dictionaries, etc., are included. The catalog conforms with the requests of technical and scientific workers and librarians by giving the date of publication of each book as well as price, number of pages, detailed descriptions and full table of contents. A copy will be sent gratis to everyone who is interested in keeping up with the latest technical and scientific progress.
*INFORM-A-GRAM KEY No. 862-V.*

**THE FORMED STEEL TUBE INSTITUTE**, Cleveland, Ohio, has recently issued a 31-page book in color to bring to design engineers a new concept of tubing—a basic material with a wide field of usefulness.

"Better Products with Electric Welded Tubing" was written for and to product designers, is illustrated with both war-time and peace-time uses of tubing and contains specifications for various tubing applications. Interested engineers and product designers may obtain this book by writing The Formed Steel Tube Institute, Keith Bldg., Cleveland 15, Ohio.
*INFORM-A-GRAM KEY No. C69-V*

**7" SHAPERS** are pictorially described in Catalog No. S43 released by the ATLAS PRESS CO., Dept. T, 1012 N. Pitcher St., Kalamazoo 13D, Mich. 4-step pulleys for countershaft and pinion shaft provide four speeds between 45 and 186 strokes per minute. The adjustable countershaft saves time in selecting and changing speeds.
*INFORM-A-GRAM KEY No. 537-V*


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***Fluid-motion***

***for modern form-dressing***

**ONE** SETTING
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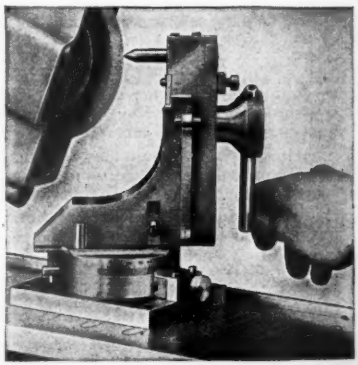
**The J & S Model "E" Radii and Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable—regardless of cost.**



*FEATURES*

**Fluid-motion dressing**
**.0001" accuracy**
**Automatic centering**
**14" wheel capacity**
**Large range yet compact**
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Known for 40 years as a precision lathe of the highest quality. Bed 36" long. Ball bearing headstock uses 1" capacity collets. Swing 8 3/8" over bed. Available with motor drive.

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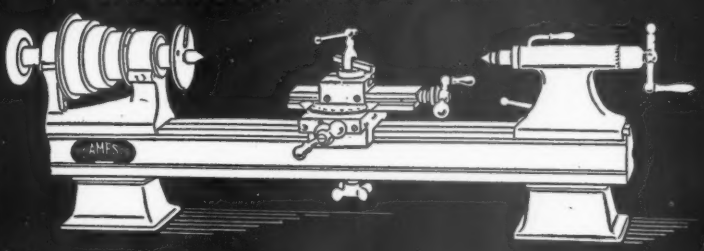


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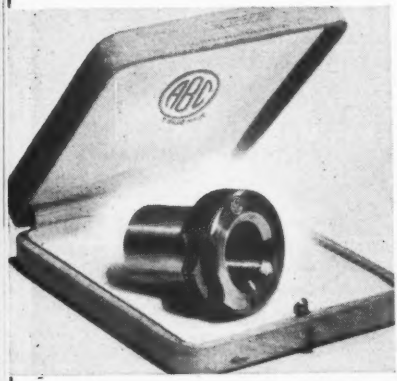

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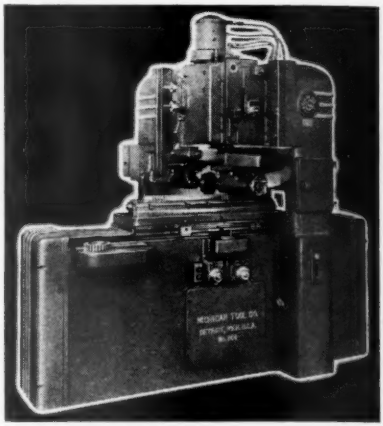
ACCURATE BUSHING COMPANY
447 NORTH AVE., GARWOOD, N. J.

## Crossed-Axis Gear Finisher

Announcement of an improved rack type gear finisher for spur and helical gears is made by Michigan Tool Company, 7171 East McNichols Road, Detroit 12, Michigan.

The new series 900 machines have been in wide use in the aircraft and military automotive industries and have produced a large percentage of the gears of most accurate involute form.

Completely hydraulic in operation, the new series incorporates two separate



hydraulic systems, one for the operation of the table and one for the head feed. The hydraulic down-feed mechanism is rapid in approach and slower in cutting, but is supplemented by a postive control for the finishing strokes. When finishing strokes are completed the head automatically returns to the starting position.

The new machine will finish gears up to 8" in diameter with a maximum length between centers of 18½". Setup provision is made for the pre-compensation of any possible distortion of the gears during heat treatment subsequent to finishing.

The rigidity of the machine has been increased by more extensive ribbing in the base and column. Improvements have also been made in the control system which facilitate closer production tolerances, quicker adjustment of speeds

## CRITERION *Boring Heads*

# Original Accuracy *Maintained*

Noted for maintaining original accuracy over a longer period. Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

**Lead Screw ground from solid AFTER hardening.**

**CRITERION MACHINE WORKS**
BEVERLY HILLS, CALIFORNIA

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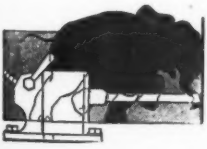
*New* **MEAD**
*Pneumatic*
# "FLAT TOP"
**WORK HOLDER**

This new type of air-operated fixture for holding small flatwork for toolroom use or production operations solves a troublesome problem. Mead "Flat Top" holds any work which is flat on the bottom, regardless of peripheral contour. Assures "dead true" perpendicularity for drilling, reaming, tapping operations. Completely described in the new Mead Air Power Catalog . . . just out.



**MEAD SPECIALTIES COMPANY**
**15 S. Market Street Dept. HA-245 Chicago 6, U. S. A.**

**$29.75** in U.S.A.

*Weight 12 Ounces; Length 6¾ In; Chuck Size ⅛ in. Wheel Guard Removed for Better Illustration*

**The Model JA is new in design both inside and outside. In it are utilized fewer parts, and they are made of Magnesium and Aluminum for extreme featherweight lightness. The alloy steel shaft diameter is unusually large for sustained smooth and true operation. This means still longer wheel life and better grinding. The speed, as before, is governed at 50,000 R.P.M. and there are selected ball bearings, front and rear. The JA Featherweight is a distinct improvement over all models previously produced by Madison-Kipp, the originators of really high speed grinders.**

**The same low price, $29.75 in U.S.A., remains. It is a post-war design for which materials have been released early. The pre-announcement output was geared to expected demand. Deliveries will be made out of stock as long as possible.**

**MADISON-KIPP CORPORATION**
**212 WAUBESA ST., MADISON 4, WIS., U. S. A.**

and regulation of finishing strokes. The lubricant and coolant systems have separate outlets thereby eliminating possible contamination.

Electrical controls now operate on 110 rather than power line voltage. More complete and detailed specifications are obtainable upon request.
*INFORM-A-GRAM KEY No. 47-V*

## New Plastics Group

The Union Carbide and Carbon Corporation, Dept. J, 30 East 42nd St., New York, have announced the formation of a New Plastics Group, which will bring together activities that are related either to the manufacture, compounding or sale of synthetic resin and plastic products. The purpose of this group is to co-ordinate the technical knowledge, sales engineering, research, production, and distribution methods for all plastics and resinous products. The new Plastics Group is the fifth products group of the UCC Corporation.

The Sales activities of the new Plastics Group will be carried on by the Bakelite Corporation. It will handle the sale of phenolic, urea resins, plastics, vinyl resins, and in addition, polyethylene resins which were originated and developed by the Linde Air Products Company, but will continue to be manufactured by Carbide and Carbon Chemicals Corporation.
*INFORM-A-GRAM KEY No.C64-V*

## Explanation

Mr. J. Wesley Cable, in his article, "Dielectric Heating", (see October 1944 issue of TDJ) stated that "production engineers throughout the world have come to consider the high-frequency induction heating unit as common and usable a machine tool as a lathe or drill-press." According to the National Machine Tool Builders' Association a machine tool is "a power-driven complete metal-working machine, not portable by hand, having one or more tool- or work-holding devices, and used for progressively removing metal in the form of chips." By this definition the dielectric equipment and high-frequency heating units are not machine tools. However, Mr. Cable is using it in a more general sense, to mean a tool used as a production element in a manufacturing set-up.

Clark

# LEVER-LOCK BORING BARS

**1.** Sizes down to 3/16" diameter. **2.** Eliminates use of solid forged bars. **3.** Tool bit held on extreme end of boring bars. **4.** Full clearance to bore or thread to bottom of blind hole. **5.** Each bar has 15° holding channel in one end, right angle channel in other. **6.** One precision ground thread tool bit and one boring bit furnished with each bar. **7.** Complete set of 4 packed in sturdy wood box $8.70.

SPECIFICATIONS

| Dimensions of Boring Bars | | Size of Cutters Round | Used with Clark Tool Holders Nos. |
|---|---|---|---|
| Diam. | Lgth. | | |
| 3/16 | 5 | 3/32 | P60R, P61R |
| 1/4 | 6 | 1/8 | P60R, P61R, P62R |
| 3/8 | 7 | 3/16 | P61R, P62R, P64R |
| 1/2 | 8 | 1/4 | P62R, P64R |

The exclusive Clark Lever-Lock feature securely grips the tool bit.

*FOR COMPLETE INFORMATION, CALL YOUR CLARK CUTTER JOBBER TODAY, or write for catalog TDJ-2-LLB*

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Robert H. Clark Company

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# A Flexible, Adaptable Tapping Machine!

## Handles a Wide Range of Jobs

The Procunier unit here illustrated, by interchanging two tapping heads will handle from a No. 2 tap up to a ⅞" tap in steel, ¾" in cast iron and ½" in brass and aluminum. That means that in your shops one Procunier can do the work of two or more machines.

In addition, all adjustments can be made quickly and easily—such as regulating compensating spring pressure, setting depth stop, changing to any of the four speeds from 390 to 2050 RPM, or adjusting timing or flow of tap lubricant. Extra long compensating springs assure uniform tapping and reversing pressure independent of operator. Tap establishes its own lead for greater accuracy. Automatic tap lubricator provides abundant supply exactly when needed. Many other features.

***PROMPT DELIVERY—SEND FOR BULLETIN*** giving full details and prices on Procunier Universal Tapping Machines, High Speed Tapping Head and Tru-Grip Tap Holder.

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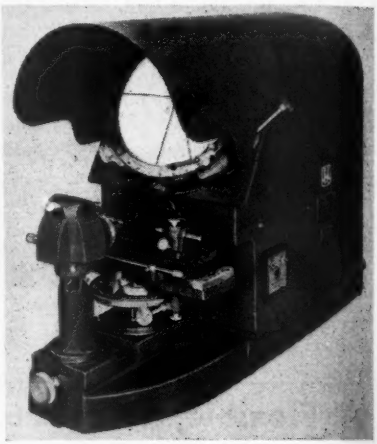
945 EAST 67th ST., CLEVELAND 8, OHIO

## J & L Bench Comparator

The Jones and Lamson Machine Company of Springfield, Vermont, has added a new model to their well known line of bench comparators. The table is 16" allowing measurements of lead and spacing up to two inches. A handwheel graduated in .0001" operates on a hardened and ground thread for making vertical measurements up to 1¾".



On one end of the table is a vernier segment with provision for compounding the table 15 degrees either side of center, for projecting the profiles of hobs, worms and threads. An angle measuring attachment is provided for measuring angles in degrees and minutes.

Centers are available for holding work up to 3" in diameter by 11" in length. Fixtures usable with this machine are: vise and right angle stage, 1" V-block and an attachment for projection by reflected light.

The following optical systems are available:

82mm objective: projects a 1.4" area to 10 X.

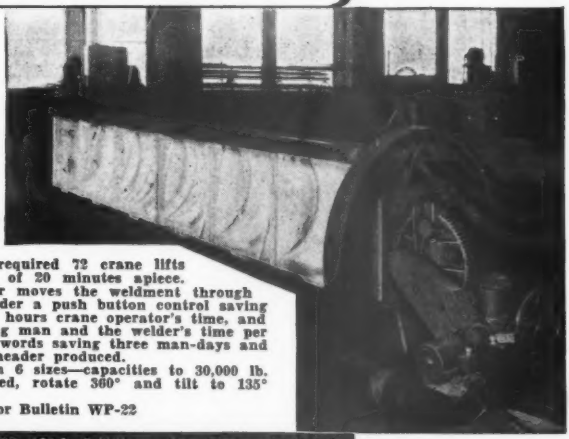
46mm objective: projects a .7" area to 20 X.

48mm objective with 10 X ocular: projects a $\frac{7}{32}$" area to 62½ X.

*(TO PAGE 202—PLEASE)*

# C-F POSITIONERS

## *Save 72 Lifts*

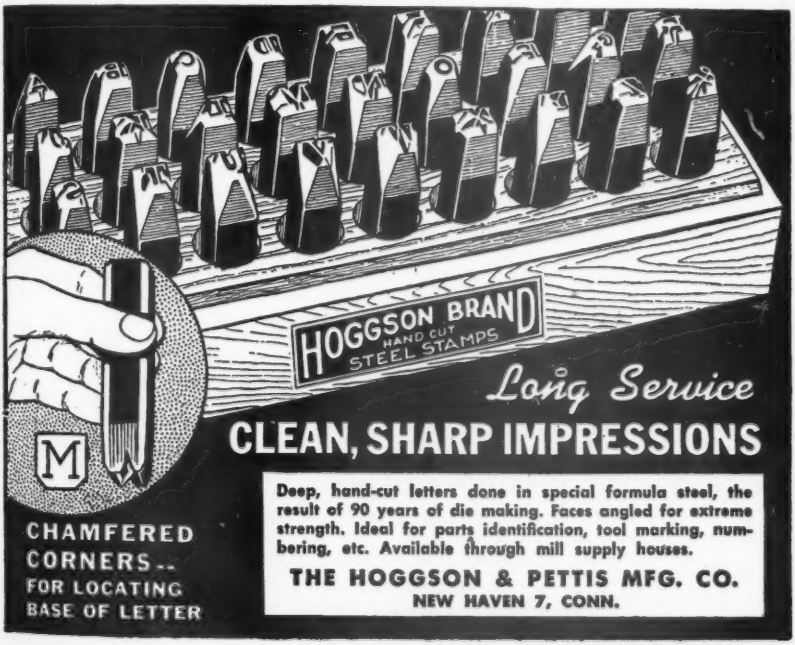


The Nordberg Manufacturing Co., Milwaukee, have eliminated 72 lifts per unit by using a C-F Positioner on the production job illustrated. These complex weldments (Scavenging air headers for large Diesel engines) have to be "procedure-welded" and formerly required 72 crane lifts which took an average of 20 minutes apiece. Now, the C-F Positioner moves the weldment through the routine positions under a push button control saving 24 hours crane time, 24 hours crane operator's time, and the same of both a sling man and the welder's time per weldment . . . in other words saving three man-days and one crane-day on each header produced.

C-F Positioners come in 6 sizes—capacities to 30,000 lb. All are pedestal mounted, rotate 360° and tilt to 135° beyond horizontal.

**Write for Bulletin WP-22**

CULLEN-FRIESTEDT CO., 1316 S. Kilbourn Ave., Chicago 23, U.S.A.

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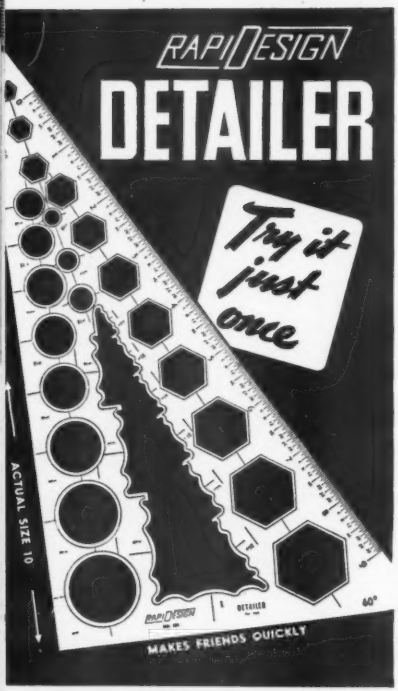
**THE HOGGSON & PETTIS MFG. CO.**
**NEW HAVEN 7, CONN.**

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*(CONTINUED FROM PAGE 200)*

48mm objective with 8 X ocular: projects a $\frac{5}{32}$" area to 50 X.
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Write for additional information on the J & L 14" Universal Bench Optical Comparator and Measuring Machine.

*INFORM-A-GRAM KEY No. 342-V*

## SAE 1945 Annual Meeting

Synthetic materials will play an important role in postwar motor vehicles the Society of Automotive Engineers reported at their 1945 Annual Meeting last month in Detroit.

The use of new synthetic materials for upholstery, trim and finishes was suggested by Morris Sanders, industrial consultant and architect, of New York. He described motor buses with ceilings opaque by day, translucent by night, and passenger cars with convertible tops as translucent as a woman's rain coat but much more enduring.

Mr. Sanders told the Materials Session that new synthetics are receiving maximum testing in warplanes and promise to provide the single and multiple laminates for exteriors capable of being post-formed for angled, corrugated, or curved surfacings. Synthetics mentioned by Mr. Sanders were vinylidene chloride, sheet vinyl, cellulose acetate, fiberglass, rayon, and nylon.

A. T. Colwell, of Thompson Products, Inc., Cleveland, Ohio, suggested, before the Truck & Bus Session, the application of water-alcohol injection devices affixed to carburetors to increase power and improve performance. Mr. Colwell stated that recent scientific studies of water-alcohol injection, indicate that a 50-50 combination of alcohol and water provides both shock control and internal cooling. Such injection would facilitate the design and use of higher compression, lighter weight engines.

Fuels of 10 to 15 octane numbers lower than normally required could be used in vehicles equipped with alcohol-water injection, which would raise the octane rating of an engine for greater power and performance.

Induction heating was characterized as one of America's most important

# TIME TO TOOL for Post-War Production!

*Replace Old, Worn-Out Machines with*

**GEMCO**

***Multi-Purpose SHAPERS***

*In 16", 20" and 24" Sizes*

These features will help you produce better products—more speedily, accurately, economically:

1—Sturdy, powerful construction; 2—Utmost precision in workmanship and performance; 3—Dependability under continued severe service; 4—Ease and convenience in operation; 5—Advanced type of force feed lubrication; 6—"LUBRIGARD" Safety Device increases the Precision Life.

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Manufacturers of PRECISION MACHINERY Since 1917

# Rawhide PROTECTS

The tough, resilient, coiled rawhide faces of C/R Hammers and Mallets strike effective blows without battering or marring . . . protect finished surfaces, machines, delicate insulation and parts. Speed die-setting, assembly. No fatiguing re-coil. Reduce breakage and spoilage. Sizes and weights for every need.

*C/R Hammers have permanent malleable iron heads which take replaceable insert faces of coiled mechanical rawhide.*

CHICAGO Rawhide MFG. CO.
1208 ELSTON AVE. ★ CHICAGO, ILLINOIS

# BURKE

## MILLING MACHINES

**No. 4 Motor Driven MILLING MACHINE Mounted on Cabinet Column**

Burke motor driven milling machines Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

***Write for complete information.***

**Burke Machine Tool Co.**

**301 E. 16th St. -:- Conneaut, Ohio**


"secret weapons" by Howard E. Somes of Budd Induction Heating, Inc., Detroit. Induction heating which accelerates production, permits the use of economical metals and increases the working and wearing strength of vital parts by large percentages has effected such vital war job applications as the use of cheap alloy steels and cast iron in the production of weapons and ammunition; the high speed production treating of automotive bearing races, axle ends, internal gears and other parts for land vehicles and aircraft. Mr. Somes also pointed out that induction heating produces superior metallurgical structures.

E. P. Strothman of the A. O. Smith Corp., Chicago, Ill., stressed the extreme importance of the selection of materials for high speed war production. Use requirements, design factors, manufacturing facilities, production speed, and adequacy for the completed job preclude reliance upon any one supposedly superior material.

Losses in supercharger induction passages now constitute the principal factors limiting aircraft engine altitude performance, Arthur P. Fraas of the Aircraft Div., Packard Motor Car Co., Detroit, informed the Aircraft Engine Session.

## Tygon

Tygon, a group of versatile corrosion-resistant materials widely used in the chemical and process industries, is described and illustrated in Bulletin 1620 issued by The United States Stoneware Company, Dept. T, Akron, O. Tygons resemble rubber in physical structure but are entirely different in chemical structure. They range from bone hard substances to soft jellies. Tygon formulations are unaffected by oils or water and are immune to the oxidizing effect of air and sunlight. Rigid, semi-rigid, or flexible sheets may be molded from Tygon. These formulations can be made crystal clear, translucent or completely opaque. Tygon possesses the virtues of adhesion or non-adhesion. Tygon sheets may be bonded to steel concrete or wood; it can also be used as a parting compound in plastic tooling applications. Tygon is used to line tanks, metal pipes and fittings and fans and ventilating equipment.

*INFORM-A-GRAM KEY No. 771-V*

# SAVE TIME

## ON BORING-TOOL SETTING

**For Retooling . . .**

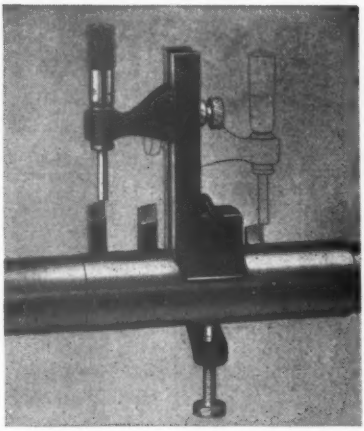
Take *one* trial cut, mike it, and use this gage to move the tool the exact additional amount required. Or, working from the O.D. of the bar, set the tool to exact position without a trial cut.

## USE THE BARTELT PEDESTAL MICROMETER

Time wasted in conventional cut-and-try methods can be eliminated. Inexperienced operators learn to do satisfactory work more quickly. Three models available—Model B, with two-slide pedestal, shown.

**USEFUL FOR MANY OTHER JOBS**

Bartelt Pedestal Micrometers are also excellent for height and depth gaging, for inspection work of various kinds, and for other set-up operations. Write for circular giving full information.



**BARTELT**
ENGINEERING COMPANY
1212 Partridge Avenue
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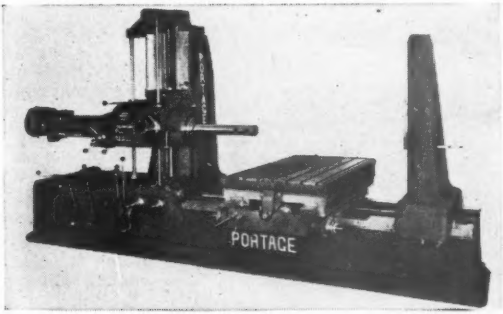
# PORTAGE

**4 INCH BAR HORIZONTAL BORING, DRILLING & MILLING MACHINE**

ROTARY TABLES




ACCESSORIES

- Designed and built to meet the need for speed and accuracy demanded of today's production.

WRITE TODAY for fully illustrated bulletin giving detailed description of the many features of this Horizontal Boring, Drilling and Milling Machine. No obligation.

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Supreme
LAY-OUT AND IDENTIFICATION DYE
IN 12 COLORS
Red
Blue
Green
Brown
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Used for Both
★TOOL, DIE, PATTERN OR TEMPLATE LAYOUT ON METAL.
★QUICK IDENTIFICATION OF BAR STOCK, SHEET OR STRIPS, TOOLS, DIES OR PARTS.
DRIES INSTANTLY
QUICKLY, EASILY REMOVED
Circular giving full information and prices sent upon request.
MICHIGAN CHROME & CHEMICAL COMPANY
6350 E. Jefferson Ave. • Detroit 7, Mich.

## "Quality Control" Handbook

"Quality Control" is the title of the new pocket size handbook on scientific inspection which has just been released by Continental Machines, Inc., Dept. TJ, 1303 So. Washington Ave., Minneapolis 4, Minn., manufacturers of precision measuring instruments.

This new attractively bound handbook is most comprehensive in its concise explanation of scientific inspection through the controls effected by precision measuring instruments. The use of over 200 photographs, diagrams, charts, and tables makes the explanation of scientific inspection interesting, absorbing, and informative. Of great interest are the many conversion tables and measuring data which give pertinent information for the precision measuring methods required in scientific inspection.

One section contains thirty-five subjects vital to quality control which are highlighted by examples showing how to use specific measuring instruments. Among the precision instruments and methods shown for quality control are the new mobile inspection units, sine bars, vernier gages, optical flats, comparator gages, etc. Another section of the book contains sixty-four key questions (and answers) which serve both as a check and test of the knowledge gained by the reader in studying this handbook.

The book is dedicated to Eli Whitney, the father of mass production, whose pioneer work in the interchangeability of parts has become highly developed only through the use of precision measuring instruments and tools. These measuring instruments are pictured, showing their functions, in everyday production, of safeguarding that production from rejects by establishing uniform control throughout the whole production setup.

Anyone reading the book's 140 pages cannot help but have an intimate working knowledge of "Quality Control" as it should be employed in modern production. As such, the book will be of particular value to plant inspection departments seeking new ways to establish quality control over their products.
*INFORM-A-GRAM KEY No. 696.5-V*

## Need extra GRIPPING POWER? Specify *Mac-its*

*Mac-it* alloy steel square head set screws are milled from the solid bar with die-cut threads. Heat-treated for maximum torsional strength and to resist upsetting of the points.

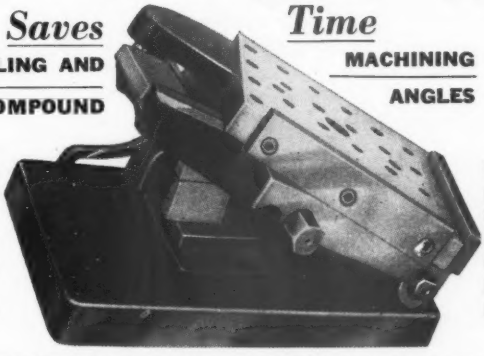
Mac-it Products Include: Socket Head Cap Screws, Hollow Set Screws, Hexagon Head Cap Screws, Square Head Set Screws, Stripper Bolts, Hexagon Socket Pipe Plugs.

**STRONG, CARLISLE & HAMMOND CO. · *Cleveland 13, O.***

# ROTO-SINE

TRADEMARK

## *Saves* ON BORING, DRILLING AND SINGLE OR COMPOUND *Time* MACHINING ANGLES



Roto-Sine uses new method of obtaining both single and compound angles. By use of gage blocks, Roto-Sine provides accurate, quick means of obtaining angles of rotation without use of graduations. Every tool shop will find Roto-Sine the answer to efficient, accurate angle set-ups.

Available in 5 inch and 10 inch models.
Table sizes—
5" Model A— 5½ x 6
10" Model B— 7 x 12
10" Model C—10½ x 12

No longer necessary to obtain angles of rotation from graduations

PRICES AND DELIVERY DATES ON REQUEST

PRODUCTS DIVISION

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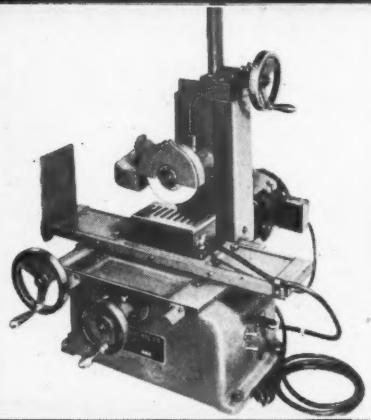
DESIGNERS OF

TOOLS • DIES • GAGES • SPECIAL MACHINES AND PRODUCT DESIGN

410 E. NINE MILE ROAD DETROIT, FERNDALE 20, MICH.

SANFORD



*High-Speed* **BENCH**
SURFACE GRINDER

**ACCURATE WITHIN .0001**

A sensitive machine built to rigid standards of accuracy and workmanship specially designed *"For the job that fits in your palm."*

**WRITE FOR BULLETIN**
**Available On M. R. O. Certifications**

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1279-81 Springfield Ave.
Irvington II, N. J.

## High Production Marking

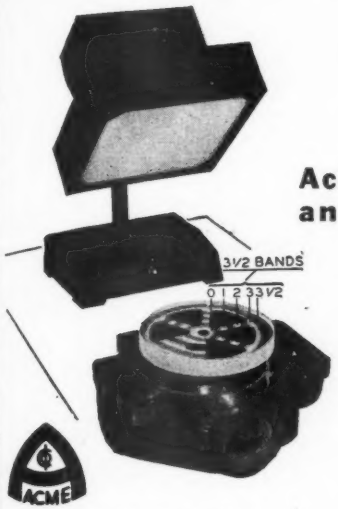
The Adolph Gottscho Company, Inc., 190C Duane Street, New York 13, New York, has just introduced their new Gottscho Indenta No. 10 which has a capacity for marking metal parts varying in diameter or thickness from ¼" to 2". Choice of size of the indented character depends upon the part being marked.

The unit comes with its own stand

and is equipped with motor, gear reduction, friction and rachet clutches, heavily constructed frame, precision bearings on rotating parts and roller bearings on other moving parts. The machine occupies little space and is compactly arranged to give sturdy and dependable operation for many years.

This machine is safe for the operator since the hands are free of the indenting operation. The mechanism will not jam as a friction clutch acts as a safety to prevent this. The operation occurs so quickly that production rates of 1200 parts per hour are not uncommon. The actual marking occurs within a fraction of a second, so that the speed and agility of the operator and the smoothness with which the parts flow to the machine are all that limit the output.

*INFORM-A-GRAM KEY No. 44-V*

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*Shop Measurements with Light Waves*

FOR MEASURING

# FLATNESS

in "tenths" or "millionths"

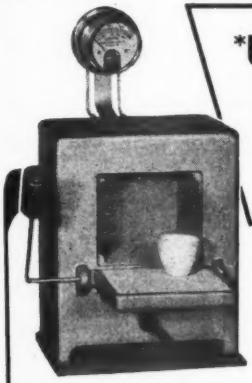
ALL YOU NEED IS AN

**Acme Monochromatic Lamp and an Acme Optical Flat**

Valve illustrated at left, will not leak under pressure because inspection shows it to be FLAT within 3½ bands (40 millionths). The bands appear when you simply lay the optical flat on a highly finished work surface and view by the light of the Acme Monochromatic Lamp. **No skill is needed — Anyone can do it.**

Send sample and state flatness tolerance. We will immediately quote suitable lamp and optical flat.

**ACME SCIENTIFIC**
DIVISION OF ACME INDUSTRIAL COMPANY
*Makers of Standardized Jig and Fixture Bushings*
**206 N. LAFLIN ST., CHICAGO 7, ILL.**
MONroe 4122



# *Uniform Temperature Handy . . . Portable Fast Heating

● The heating element in the Temco furnace operates with unusual speed. A working temperature of 1500° F. is attained in only 30 minutes and intermittent peak loads of 1850° F. are within the practical range of this rugged, long life furnace. A four point switch provides temperature control in four ranges and adjustable rheostat bands allow close heat selection within any range. The accurate, dependable pyrometer is calibrated to 2000° F. and 1100° C. in 50° increments.

***MUFFLE CHAMBER** has the exclusive feature of an embedded heating element which covers all four sides of the heating chamber. This eliminates "cold spots", assures a uniform temperature in every part of the chamber, and protects the elements against damage and oxidation.

Temco furnaces are built for either 115 V. or 230 V. current consumption 1200 watt maximum. Heating chamber 4" wide, 3¾" high and deep. Outside dimensions 8¾"x 13½"x10". Shipping weight 30 lbs. **COMPLETE WITH PYROMETER (115 V.).....$42.50**
**For 230 V.—$5.00 additional**

***See your supply house or write***

**THERMO ELECTRIC MFG. CO., 474 W. Locust St., Dubuque, Iowa**

# TEMCO ELECTRIC FURNACE

## Machining Propeller Blades

The Turchan Follower Machine Company, 8257 Livernois, Detroit 4, Michigan, has recently devised a method whereby airplane propeller blades can be machined several times faster than formerly through the use of the Turchan Hydraulic Follower Attachment by the simple machining job of duplicating the blade contours with a planer and thus performing the operation in 1/20th the time.

Using a model as a guide, the Turchan attachment is shown here planing the irregular contours on forged, two-piece,

brazed propeller blades. On this operation the tolerance requirements are within .008" per inch measured transversely against a master template. The material is 4340 SAE steel and is cut at a speed of 40 feet per minute. On other similar operations, such as planing turbine blades and cams of irregular shapes, tolerances may be held even closer.

*INFORM-A-GRAM KEY No. 104-V*

★

## New Patents of Tooling Interest

*(for obtaining, see page 168)*

CRANKSHAFT GRINDER, No. 2,349,108.
INDEXING CHUCK, No. 2,349,119.
DRILL JIG, No. 2,349,142.
OFFSET DRILLING ATTACHMENT, No. 2,349,156.
STOP FOR LATHES, No. 2,349, 159.
METALWORKING MACHINE, No. 2,349,168.
MACHINE TOOL, No. 2,349,171.
ALL-ANGLE MILLING MACHINE, No. 2,349,199.
ADJUSTABLE MULTIPLE SPINDLE DRILL HEAD, No. 2,349,240.
VISE, No. 2,349,291.
UNIVERSAL TOOL GRINDING MACHINE, No. 2,349,324.
THREAD TAP GAUGE, No. 2,349,330.
MACHINE TOOL, No. 2,349,382.
SAW, No. 2,349,400.
PORTABLE ELECTRIC TOOL, No. 2,349,401.
EXPANDING CHUCK, No. 2,349,447.
MEANS FOR APPLYING TUBULAR ARTICLES TO DIES AND THE LIKE, No. 2,349,456.
BORING MACHINE, No. 2,349,526.
WORK SUPPORT, No. 2,349,537.
CENTER PUNCH, No. 2,349,567.
SELF-LOCKING SCREW DEVICE, No. 2,349,591.

ANGLES
TO A MINUTE...
IN A MINUTE!
THE BEMISINE
SPEEDS UP AND SIMPLIFIES SETTING ANY ANGLE FROM 0 TO 90° —USING ONLY A 2" MICROMETER!* IT HOLDS THE WORK! FASTER THAN A SINE BAR OR PROTRACTOR! CONVERTS SET-UP TIME TO PRODUCTION TIME ON SURFACE GRINDERS, JIG BORERS AND MILLERS.
*Also Used With Standard Gage Blocks
NICHOLS-MORRIS CORPORATION
44 CHURCH STREET NEW YORK 7, N.Y.

# "10 MILLION PIECES

**without a single rejection, thanks to MICRO-CHEK"**

**-says LUCAS SCREW PRODUCTS, Inc.**

**Priced from $9.75**

Users of nearly 100 Trico MICRO-CHEKS, Lucas Screw Products, Inc., of Rochester, N. Y., reports:

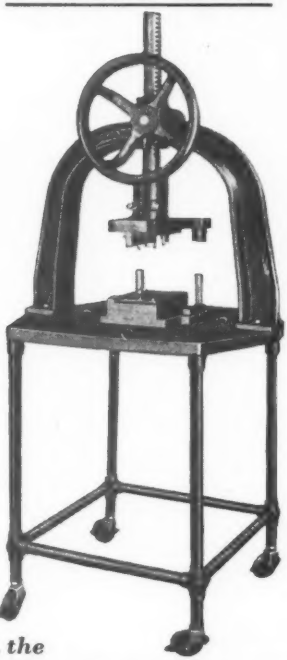
"We find them to be a low-cost economical way of controlling accuracy on high precision automatic screw machine production. In numerous cases, we have reduced our gage cost from 50 to 75 per cent. They check close tolerances . . . eliminating fatigue and uncertainty upon the operator. Their simplicity enables us to use inexperienced help in final inspection. In one case we produced 10,000,000 pieces without a single rejection from the prime contractor."

Speed inspections in YOUR plant with TRICO MICRO-CHEK Comparator Gages, now in use in more than 3600 war plants . . . on machines, on inspection lines. Send for booklet which illustrates many applications.

TRICO **MICRO-CHEK**
TRICO PRODUCTS CORP.
40 Trico Square, Buffalo 3, N. Y.



# COMPLETE THE DIE-SET AT YOUR BENCH



*with the*

## LACEY DIE-SET MACHINE

Here is a truly "one man" press that operates with one hand and under full manual and visual control.

Handy for tool and press rooms, it permits the diemaker to complete a die-set *right at his bench* . . . saves toolroom and handling costs.

Positive, true punch to-die alignment is assured at all times, thanks to the Lacey's sturdy, open construction. And punches can be removed as often as needed without disturbing alignment once the die-shoe is clamped to the table and punch holder fixed in position in the ram. No pry bar or hammer is needed to separate punches.

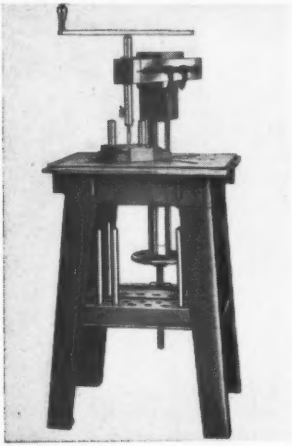
The Lacey Die-Set machine is sensitive for delicate work yet rugged enough for fitting up heavy die-sets. Useful, too, for shearing certain types of punches.

Write today for complete details.

Sole Distributors

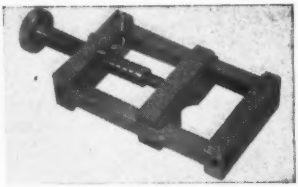
**MOORE SPECIAL TOOL CO., INC.**
**740 Union Ave. Bridgeport 7, Conn.**

## 2 Producto Tools



**1. PRODUCTO**
**UNIVERSAL HAND TAPPER**

**This recently developed machine insures accurately tapped holes and prevents tap breakage. No setting up required. Holes can be tapped or reamed in any position on table, using tap sizes from No. 5 to 1" diameter.**



**2. PRODUCTO**
**PRECISION TOOL ROOM VISE**

**Handy, lightweight, large opening capacity—a precision tool for jig borers, surface grinders and accurate tool room purposes, All parts hardened, surfaces and jaws ground at right angles and parallel. Sturdy, tight gripping, fast adjustment.**

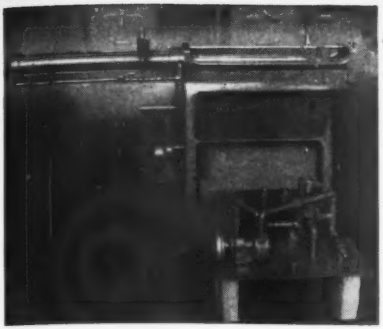
***Send for details***

THE PRODUCTO MACHINE COMPANY
BRIDGEPORT 1, CONNECTICUT
BRANCHES: Detroit, Indianapolis, New York City

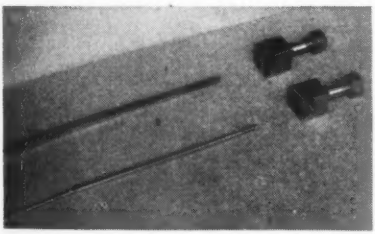

## American 1-ton 20" Stroke Broaching Machine

The American Broach and Machine Company of Ann Arbor, Michigan, (Dept. TD) has announced a new horizontal, one-ton, 20" stroke, broaching machine built to meet the demand for a fast, precision machine of small size with all the features of a large machine. It is designed for either pull or push broaching and can also be used for light push assembly jobs. The box section machine bed is rugged and well balanced and will amply support the components mounted on it. Its construction embodies the following features: the

draw head has a long bearing with bronze take-up gibs; the ways are of steel, bolted-in on the solid bed frame; the face plate is finished over its entire exterior surface and the inside of the plate is finished over an area large enough to permit a bushing to be used inside of the bed in the face plate for pushing operations. The cylinder for applying the hydraulic force is made of steel and is of the conventional broaching machine type, with an adjustable packing gland. The pressure gage is mounted so that it can be read from either side of the machine. The stroke adjustment is by means of a stop collar which can be set for any length stroke up to 20". The work cycle of the machine is fast, the maximum cutting stroke of 20" being completed in 4½ seconds. The control is a hand lever which operates a 4-way hydraulic valve. This control and the electric motor switch are located on the front of the machine within handy reach of the operator. Variable speed is provided



through an automatic, diameter-changing drive pulley and gives a speed range of from 18 to 24 feet per minute. The speed is conveniently varied by means of a cam lever located in back of the motor mounting. To facilitate service the hydraulic units are all compactly mounted on one base, removable from the rear of the machine. The oil reservoir is located in the base of the machine and is equipped with a gauge and drain cock. A lubricating oil tank, pump, spout, strainers, chip trough and gauge are additionally available. Two types of pull heads are used for connecting various styles of broaches. One has three tapped holes for broaches with threaded shanks, thereby the one head serves for three different sizes of shank

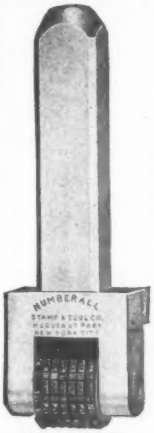


threads. The other pull head is for broaches of round, square or other shapes. It is automatic in connecting, and release is accomplished by slightly turning the broach. All types of broaching tools, heads and fixtures can be supplied. Additional detailed and illustrated information can be obtained from the manufacturer.

*INFORM-A-GRAM KEY No. 708-V*


NUMBERALL

**MULTI-WHEEL NUMBERING MACHINE MODEL 70**



Model No. 70

The most efficient method of stamping numbers into metal. Repeats the same numbers until changed. Stamps numbers, etc., quickly . . . neatly. Perfectly aligned. Much better marks are produced by these machines than by single stamps or steel type, and at a far lower cost. Shank for Hand or Press and with any number of wheels from 3 to 20.

*Write for Bulletin TD70.*

**IMPROVED TYPE HOLDERS**

**For Stamping into Metal, etc.**

Hand or Press style. Type can be easily, quickly loaded and unloaded. Simplest construction . . . Just a sturdy pin holds the type securely. No screws nor springs. Super-quality steel type made in various sizes: 1/32″ up to 1/2″ figures and letters.

*Write for Bulletin TD23H*

STEEL TYPE

**NUMBERALL STAMP & TOOL CO.**

HUGUENOT PARK STATEN ISLAND 12, N. Y.

# OLIVER

## DIE MAKING MACHINES

**SHOULD BE A PART OF YOUR POST WAR PLANNING**

They will greatly simplify your Tool and Die program. They will speed up those many die jobs. They save 50 to 60% of the labor as compared to hand methods and permit the use of less skilled mechanics.

• • • •

Avoid cheap substitutes — buy the Original Oliver — a tried and proven tool—over 25 years of satisfactory service to thousands of users. Excellent delivery.

• • • •

Send for complete literature today—put this machine to work — you will find it to be the busiest tool in your shop. Model S-1 illustrated.

*We also build Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Template Tool Bit Grinders, Point Thinners*

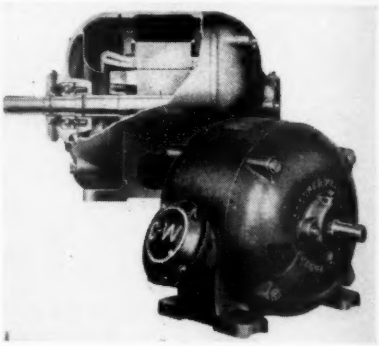
**OLIVER INSTRUMENT COMPANY**

1436 E. Maumee St. Adrian, Michigan


## New Crocker-Wheeler Protected Type Motor

A new motor combining the surplus capacity of the conventional open motor with protection against dripping liquid, metal chips and other foreign matter, has been developed by Crocker-Wheeler, Dept. TJ, Ampere, N. J.

Rated 40° C rise, full load, continuous duty, with a 15% service factor, these protected type motors provide added protection at open motor prices.



At present these motors are available in sizes up to and including the "284" frame. Mounting dimensions conform to the standards of the National Electrical Manufacturers Association.

There are no openings in the frame or shield above the horizontal center line. This, together with the shielded construction of the ventilating openings, makes these motors suitable for machine tool and similar applications where other types of enclosures have been required.

Centrifugal seals permit the use of softer grease for better lubrication and longer bearing life. The Crocker-Wheeler "ALUCAST" rotor construction, in which the bars, fans and end rings are cast in one operation from aluminum alloys, is employed.

Other features of these many purpose motors include: heavy cast frame construction, coils protected by vinyl acetal insulation, interchangeable front and rear shields, and guides for directing cooling air over all surfaces.

*INFORM-A-GRAM KEY No. 748-V*

# Newton AUTOMAT

Available now for SOUTH BEND, LOGAN, ATLAS, CRAFTSMAN, SHELDON, CLAUSING, and similar lathes.

## Converts

**HAND-OPERATED TURRET LATHES INTO RELIABLE AUTOMATICS . . .**

**PRICE $295**

HERE is relief from manpower shortage and losses from rejects incurred by operator inexperience and fatigue—a practical, highly efficient means of greatly increasing output and profits, easily installed on any bench lathe. The unit is very simple in design and of rugged, enduring construction—as foolproof as a mechanical device can be. The set of standard cams will handle almost any job. The member which actuates the cross slide is a torque rod which cushions the shock of forming and cut-off operations, assures uniform feed and accurate repeating, prolongs tool life. An automatic cut-out, quickly adjustable to work of different character, reduces tool spoilage and parts rejection. A Schrader-engineered three-way valve operates any collet closer. Put this easily installed, money-making unit to work for you now. It will pay its cost in less than 30 days!

**NEWTON MANUFACTURING COMPANY**

**214 West Seventh Street • Los Angeles 14, California**

# REGRIND TAPS IN 5 MINUTES

## . . NOT THREE HOURS!

**UNIVERSAL INDEXING HEAD** often speeds grinding 12 times. Jobs normally requiring two to three hours of laborious trial and error work now can be done in just five minutes. The three plane indexing head can do the job for you, as it did in this case:
A customer had a special tap which required 3 angles to be ground, a 45° breaking angle, a 15° gun barrel angle and a 3° hook angle on the gun barrel angle. Using the Universal Indexing Head, only 2 passes per flute under the wheel were necessary to get number fit and exact duplication.

The Universal head bolts onto any tool or surface grinder you may have and holds tools firmly. It will index 360° in EACH of three planes for ANY simple or compound angle. You'll get higher precision work because you needn't shift tool in holder.

**GET COMPLETE STORY**

Investigate this unusual grinding attachment. It will pay you to do so as it has Boeing Aircraft, Chrysler, General Electric, etc. Write now for full information.

**CLEVELAND TOOL ENG. CO.**
**1261H West Fourth Street**
**CLEVELAND, OHIO**

**SEND COUPON TODAY**

CLEVELAND TOOL ENGINEERING COMPANY
1261H W. FOURTH ST., CLEVELAND, OHIO

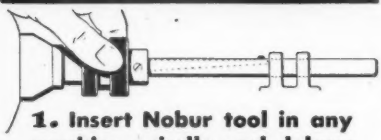
Please send complete story and Data Sheet H showing how Universal Indexing Head can help me.

NAME .....

ADDRESS .....

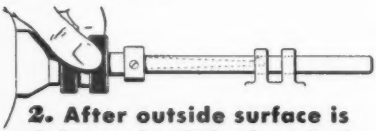
CITY .....STATE .....

# How to deburr holes faster!

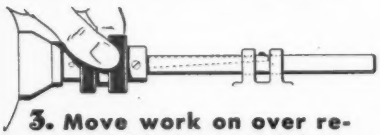


**1. Insert Nobur tool in any machine spindle and deburr outside surface of work.**

Works like a drill—operator works with complete safety—parts can be burred as fast as they can be handled by operator.



**2. After outside surface is deburred, slide knurled sleeve back to retract blade.**



**3. Move work on over retracted blade and deburr inside surface.**

Double-edged cutting blade thus instantly removes burrs around holes in flat or curved surfaces of single or multi-walled parts—smoothly and accurately.

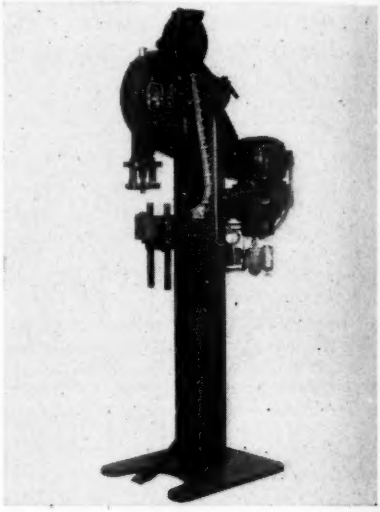
Send for deburring folder. Write

**NOTE**
All Nobur tools are now furnished with pilot shafts hard chrome plated!

**NOBUR MANUFACTURING CO.**
912 NO. ORANGE DRIVE
LOS ANGELES 38, CALIFORNIA


## Tomkins-Johnson "Rivitor"

Three operations are performed at one stroke of the ram with this electrically powered T-J "Rivitor" manufactured by the Tomkins-Johnson Company, Dept. TJ, Jackson, Michigan, and especially adapted to the job of piercing, dimpling and riveting bail ears on pails, using 1¾ lb tinners' rivets.



The rivets are underfed by the machine, as on a standard underfed "Rivitor". The unpierced pail and ear are placed over the rivet and properly located by gages. When the ram descends, a combination piercing and dimpling die, mounted on a spring-actuated pressure pad attached to the ram, forces the work over the rivet, piercing and forming a dimple in the pail and ear.

The dimple is deep enough to prevent the manufactured head of the rivet from projecting inside the pail. At the end of the down stroke of the "Rivitor", the rivet set forms a slightly rounded head on the rivet.

Other Tomkins-Johnson products include air-powered "Rivitors" for aircraft riveting, air and hydraulic cylinders, clinchers, die sinking milling cutters and air controls.

*INFORM-A-GRAM KEY No. 151.5-V*

**UP-TO-DATE STORAGE of boxes of Tools, Parts, Materials**

**Every box is instantly accessible when you use STACKRACKS. Heavy containers slide in and out like drawers—you can get at the contents of any one quickly and easily without disturbing the others. Patented STACKRACKS, to fit your boxes, interlock to form storage units of any size, shape or capacity.**

STACKRACKS

**Manufactured and sold in Canada exclusively by Walter H. Wickware, Ottawa**
**Write Stackbin Corp., 97 Troy St., Providence 1, R. I.**

**STACKBIN SYSTEM**
*"Stacked and Still Accessible"*

## *Here's a Practical Guide for Tool and Die Makers*

**Written in easy-to-understand shop language, this practical guide is packed with usable information on steel selection, tool making, heat treating, furnace atmosphere, "trouble shooting", and testing techniques.**

**Widely used in toolrooms and machine shops throughout the country, TOOL STEEL SIMPLIFIED helps to improve tool performance and cut costs. It meets the urgent need for an authoritative, inexpensive handbook for all those who are responsible for the design, making, or heat treating of tools.**

**TOOL STEEL SIMPLIFIED**
By FRANK R. PALMER
*Vice President of The Carpenter Steel Company*
315 *Pages* 205 *Illustrations*
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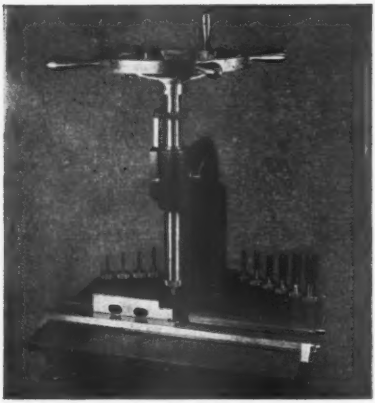


*Lassy* **TAPPER**

PATENTS PENDING

**SAVES TIME, TAPS, EXPENSIVE LABOR**

**1.** HOLDING BARS eliminate need of vise. Hold work firmly. Prevent Tap breaking torque.

**2.** TAP ADAPTERS do away with extra spindles. Change taps in a jiffy.

**3.** DEPTH GAUGE always visible. Prevents freezing taps in blind holes Adjusted in an instant. No lost time on over tapping depth.

**LASSY DEPTH GAUGE**

Cuts tap breakage. Set tap in hole, set gauge at zero, ready for tapping to depth required.

**Lassy Precision V Block Angle Iron Model 15**

PATENTS PENDING

For rapid accurate inspection, layout, jig boring and grinding. Hardened, normalized, ground and lapped.

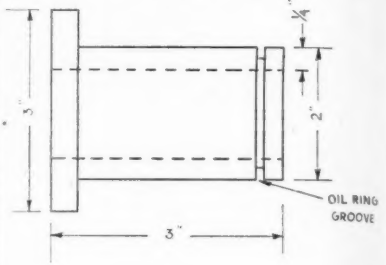
**LASSY TOOL COMPANY**

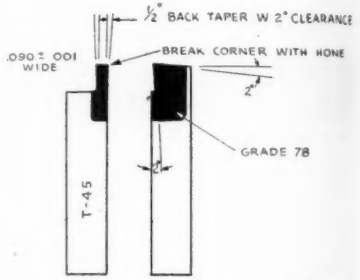
**96 Bohemia Street**

**PLAINVILLE, CONN.**


## Standard Turning Tool Converted to Grooving

A standard carbide tipped turning tool was recently converted into a precision grooving tool. The job consisted of grooving a bushing made of SAE-4140 bar stock, Brinell 290-310. The groove was .160" x .090" plus or minus .001". Originally a HSS tool was used which




COURTESY CARBOLOY CO., Inc.

gave from 10 to 12 pieces between grinds. Rejections were high because of the rough finish and production was low.

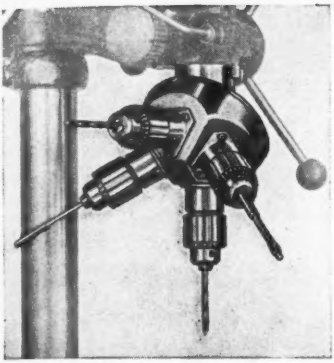
A standard, right hand turning tool with a straight tip of Grade 78 Carboloy cemented carbide, having high resistance to wear, was ground as shown. The tool was then rotated 90° and the steel underbody cut away. The result was an inexpensive grooving tool which combined high precision with greater strength than is possessed by the usual carbide grooving tool due to the greatly increased braze area.

With this, a cutting speed of 300 sfpm was maintained with a .003" feed. The number of pieces between grinds rose to 125, and the quality of finish approached that of a ground surface.

THE NEW

# QUADRILL

TURRET ATTACHMENT FOR DRILL PRESSES!



**4 DRILL PRESSES IN 1**

- **Rigid Alignment — Strictly Accurate**
- **Easily Attaches to Quill of Press**
- **Quick Indexing**
- **Finger-Tip Control Changes Positions**

Multiply drill press production 4 times with the new QUADRILL. Attaches directly to the quill of most drill presses. Three drills remain stationary for safety while only drill in work position operates. Actually converts a single drill press into four. Does away with moving work from press to press and reduces frequent changes of tools. Saves floor space. All this and more. Write for complete details and prices today.

*Sold on Positive Money-Back Guarantee*

**CHICAGO**

**DRILLET**

**CORPORATION**

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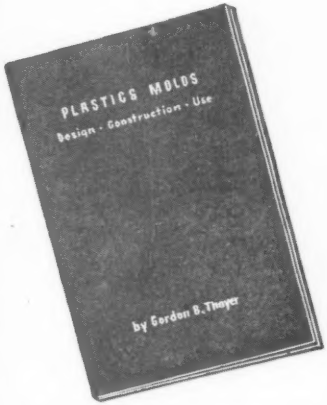
# PLASTICS MOLDS

*Design • Construction • Use*

**Second Edition**

**By Gordon B. Thayer**




CLASSROOM text or home study manual, Thayer's **Plastics Molds** is the practical, usable guide to the product designer as well as the wide-awake mold shop man.

State University extension classes use this book as a basis for instruction because of its "shop-wise" approach to an important new field, and workers in the plastics industry are finding it equally valuable.

**Copies are $3.50 each postpaid. Use our handy postage-free card on page 146-A. Discount on Quantities.**

AMERICAN INDUSTRIAL PUBLISHERS

**355 Fairmount-Cedar Building**

**CLEVELAND 6, OHIO**

Four high honors, headed by a new Army-Navy E award for production excellence, have been received recently by the Decatur plant of Goodyear Clearwater Mills, prime producer of rayon and cotton cord and fabric for military tires.

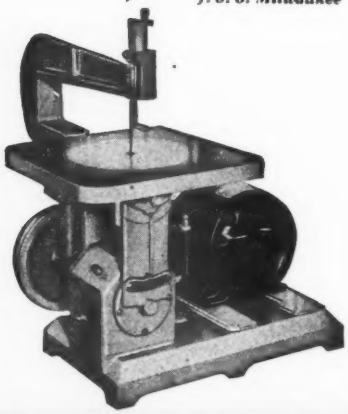

**ATLAS DIE FILER**

**This sturdy and well designed bench type machine, for rapid and accurate die filing and sawing, will eliminate many costly hand operations.**

*Complete with motor and saw attachment at*

**$125.00**

*f. o. b. Milwaukee*



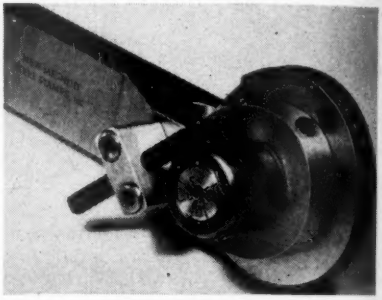
**Milwaukee Chaplet and Mfg. Co.**

1023 S. 40th St. • MILWAUKEE, WIS.


## Automatic Roll Marker

An improved automatic roll marker for imprinting serrations, calibration lines, letters, etc., on finished metal parts is now available from New Method Steel Stamps, Inc., Dept. TD, 147 Jos. Campau, Detroit 7, Michigan.

The marker is equipped with a device for adjusting the tension of the automatic spring return of the marking



roll marker. Designed primarily for use on automatic screw machines where large quantities of parts must receive identical markings this new roll marker can also be used on lathes, shapers, etc.

Adjustment of the tension on the automatic spring return from light to heavy can easily be made to accommodate the marking of parts with different size roller marking dies. It also permits adjusting the return speed of the roller to correspond to the machine work cycle. Calibrations, stamped on the spring housing of the marker, aid in setting the correct tension on the automatic spring return device. As an added feature the automatic spring return has been fully enclosed thereby eliminating any chance of the spring becoming broken by carelessness.

Although the holder shown is equipped with a solid type roll, interchangeable roll markers are available. These new automatic roll marking devices are standardized as to general design, with shanks to permit mounting in conventional tool holders, but they are also available for special marking requirements.

*INFORM-A-GRAM KEY No. 122-V*

*If you want*
**PROMPT DELIVERY**
*Phone or Write*

**BONE**

*Specialists in*
**TOOLS - GAUGES**
**DIES - FIXTURES**
*and* **EXPERIMENTAL WORK**

**DESIGNERS**
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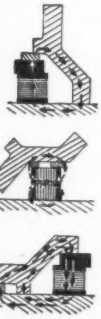
**NO JOB TOO DIFFICULT**

*Phone Sales Manager:* *Vermont 7-7270 Detroit*

**BONE TOOL & GAUGE CO.**

17510 Grand River Avenue Detroit 27, Michigan



**THIS IS NEW**

The arrows indicate the path of the magnetic flux in the new

**Power Grip Magnetic Chucks**

Uneven or odd shaped pieces are held as shown with plain steel blocks (the black blocks are solid).

These chucks have often returned their cost, by holding work without expensive jigs or fixtures, on one job.

Furnished complete ready to plug into 110 volt A. C. lighting circuit, with reversing control. Nothing more to buy. Complete unit easily portable. GUARANTEED.

Write for information or send print for details

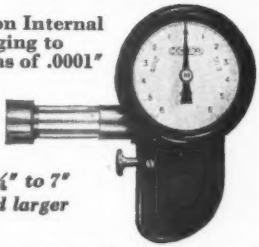
**Rockford Magnetic Products Co.**

1306 Eighteenth Avenue, Rockford, Ill.

Plan a "MATCHED GAGING" Routine with

**COMTORPLUG**

Precision Internal Gaging to fractions of .0001"



*Sizes: ¼" to 7" dia. and larger*

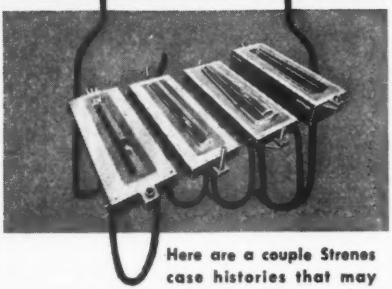
Where production involves precision bores, use Comtorplug AT THE MACHINE, as well as for inspection, to increase output and decrease rejects. Unlike a limit gage, Comtorplug enables operator to detect IN THEIR EXACT AMOUNT off-size, out-of-round, front or back taper, etc.

*Request Bulletin 29*

**THE COMTOR CO.**

82 Rumford Ave. Waltham, Mass.

# STRENES METAL POINTS THE WAY



Here are a couple Strenes case histories that may suggest a way to reconvert to civilian production a little faster.

**Tractor Top-Dies**

Strenes Metal—cast-to-shape—was specified for stamping tractor hood tops. An accurate cost check showed a saving of around 50% in machining time due to the cast-to-shape construction. On reconversion tooling rush, such a saving will be highly advantageous.

**Hydrator Pan Die**

Dies of Strenes Metal stand up, too. One refrigerator hydrator pan die, for instance, stamped 2,000,000 parts with a 3½" draw out of .50 material. And, due to the self-lubricating property of the metal, stoning and polishing operations were virtually unnecessary.

Both for civilian and war products, Strenes Metal has been a definite help on many tooling programs. Facts and figures on request. Write today.

***Strenes Metal for drawing and forming dies.***

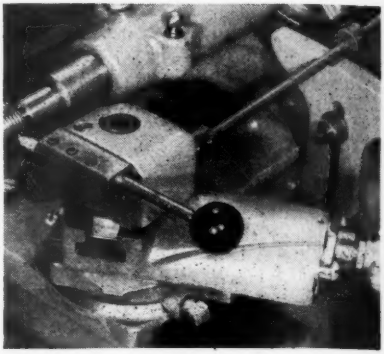
**THE ADVANCE FOUNDRY CO.**

Dayton 3, Ohio

*Strenes* METAL


## Lathe Tool Attachment

The Foulk Engineering Company, 4208 Airport Road, Cincinnati 26, Ohio, has recently developed a lathe tool holding attachment which retracts a turning, chasing or boring tool from out of either an internal or external cut at any predetermined point.



The "Retract-A-Tool" is designed to increase the speed of turning or chasing operations, particularly in blind holes or at close shoulders, by as much as 400%. As the backing out of the tool point is positive and instantaneous, the operator need only return the carriage to its starting point after the retraction occurs. Resetting of the tool point is accomplished by lifting the ball-end lever, which is above the top slide.

When turning or chasing up to shoulders, Retract-A-Tool's action makes it unnecessary to neck the work, and because no cross-slide movement is needed, the gib may be tightened on production runs to give increased rigidity.

The speed of the repetitive chasing operation is limited only by the skill of the worker in engaging the half-nut at the right point. Consisting of a tool holder and body, a stop bracket and an interconnecting rod, the Retract-A-Tool requires so little set-up time as to warrant its use for occasional toolroom jobs as well as for regular production work.

It is made in two sizes which encompass the full range of standard bench and engine lathes and is also applicable to many turret lathes. Write for additional information.

*INFORM-A-GRAM KEY No. C82-V*

# PUNCHES AND DIES

## FOR POWER MACHINES

Carried in New York stock in standard round, square, flat, and oval sizes. Special cutting tools designed or made to your blueprints or specifications.

CATALOG No. 8 AVAILABLE

**T. H. LEWTHWAITE MACHINE CO.**

314 East 47th Street • New York 17, N. Y.

# *GAGE HANDLES*

## *STEEL-BLACK-FINISH*

## PLUG AND TRI-LOCK

Handles will fit gages of standard size. Precision made for accuracy of fit and long life.

These steel handles are economically priced and can be had in any quantity.

*Write for Further Details*

**GREAT LAKES METAL SPECIALTY & MFG. CO.**

1448 West North Ave., Chicago 22, Illinois

# "ROCKWELL" HARDNESS TESTER

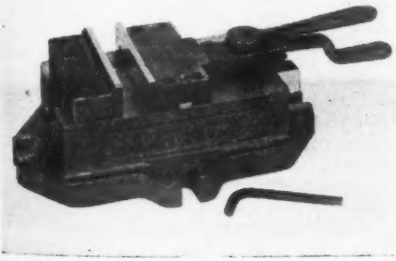
*Immediate Shipment*

THE NEW "J" MODEL

371 Concord Ave. New York 54, N. Y.

**WILSON** MECHANICAL INSTRUMENT CO. INC.

An Associate Company of American Chain & Cable Company, Inc.



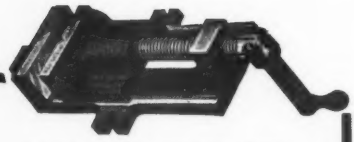
## HARTFORD MILLING VISE

The "Four-Point" Milling Vise grips and releases quickly due to the design of the cam-faced and eccentric handles. The eccentric handles provide locking with tremendous binding force. The movable jaw is a single heat-treated steel drop-forging for great strength. The jaws give absolute alignment.

Bulletin No. V-100 gives full specifications.

THE HARTFORD SPECIAL MACHINERY CO.

291 HOMESTEAD AVE. • HARTFORD CONN.



## YOST DRILL PRESS VISE

**This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.**

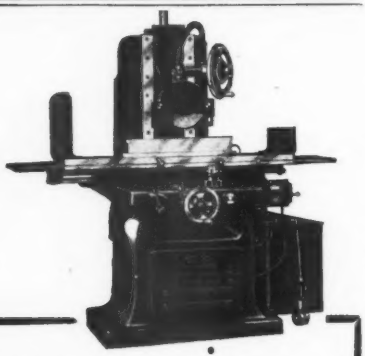
**Offered in two sizes.**

| Vise No. | Width of Jaw, Inches | Opens Inches | Weight Pounds |
|---|---|---|---|
| 1D | 3½ | 3½ | 12½ |
| 2D | 5 | 5½ | 23 |

**Do you need a vise of ANY type?**

***Write today for bulletins on the extensive Yost line***

**YOST MFG. COMPANY**
**1000 MAIN ST.**
**MEADVILLE, PENNSYLVANIA**



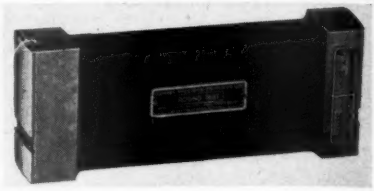
**Grand Rapids Surface Grinders are the result of over thirty years actual experience in the building of precision grinding equipment . . . A patented vertical head adjustment is featured. When using the circular Vernier reading for extreme accuracy, the graduated circular plate can be set at zero in relation to the pointer extending inward from the rim of the large hand wheel. The pointer will travel in the same direction as the small inner hand wheel, but at 1/4th the speed . . . Attractive and amply illustrated Bulletin GL-100 is available.**

**GALLMEYER & LIVINGSTON CO.**
304 Straight Ave., SW. Grand Rapids 4, Mich.


## Carbide-Tipped Plug Gages

An entirely new type of Plug Gage is announced by the Yankee Precision Products Company 965 Farmington Ave., West Hartford 7, Conn.

Designed for "go" and "no-go" production gaging where the problem of wear has always necessitated frequent replacements, ROUNDTEST Gages are



equipped with full carbide-tipped gaging surfaces finished to true arcs of the Go and No-Go dimensions so that by rotating the gage it is possible to test for roundness, in addition to size, and to reject holes that are out of round at any point. This results in a quicker and more complete inspection than has been possible with standard full-round plug gages.

The bodies are made of a special iron, thoroughly seasoned to assure stability. The gages are light in weight, highly sensitive, easy to use and fully guaranteed to specified standards of accuracy. They are available in a wide range of standard sizes and also in special sizes and styles on order. A detailed descriptive bulletin will be sent on request.

*INFORM-A-GRAM KEY No. C74-V*

★

A fourth white star to add to their "E" flag has been awarded the Simmons Machine Tool Corp., Albany, N. Y. One of the first of 20 industries to receive the joint Army-Navy award and E pins when introduced in August 1942, also the first winner in the machine tool rebuilding industry, Simmons is the only war industry in its field to receive five awards.

The Easy Way to Carry Any Load

**PORTELVATOR** *(Elevating Table)*

You don't need human "pack horses" in your plant . . . one man or boy can push things around on PORTELVATOR. Use it, too, for overhanging work, work bench, lifting, stacking and other purposes.

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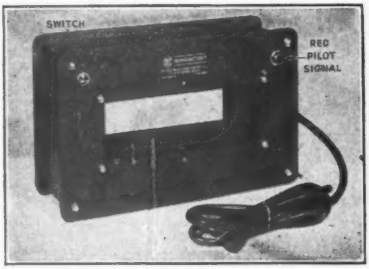
**INSIDE MICROMETER SETS**

TU-MI-CO TUBULAR Construction—strong, light, easy to assemble and handle. All tips and connecting surfaces are hardened and lapped for long, trouble-free service. Sets complete with mandrels, wrenches, instructions—in strong wood cases.

**TUBULAR MICROMETER CO.**
ST. JAMES MINN.

AMC DEMAGNETIZER

A Tool Room Necessity




Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

**Available for either 115 V. or 220 V.**

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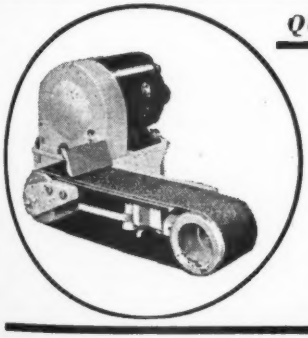

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This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit!

Other styles and sizes in New Manual on Finishing — Write Today

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FOR CHECKING AND GRINDING EXTREMELY ACCURATE ANGLES

Simple operation with gage blocks, sine table and formula (sine × 4 + 0.300") gives any angle from 0 to 90 deg. . . . with accuracy to 4 millionths in one inch . . . and positively maintains it with split-bearing locking screws. A hardened and ground complete unit of plate and base, packed in attractive case.

Available *now.*

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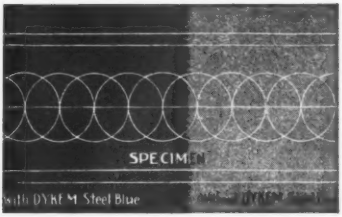


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***STOPS LOSSES***
**making dies & templates**

Simply brush on, ready for the layout in a few minutes. The dark blue background makes the layout lines show up in a sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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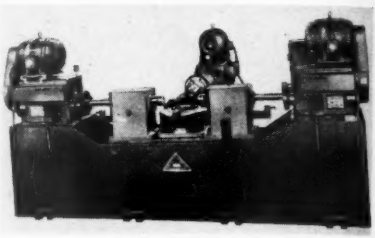
2201 N. 11th STREET ST. LOUIS, MO.

## Lemaire Special Boring and Facing Machine

A special horizontal three-way machine for boring five holes and facing four holes in a truck axle mounting, or carrier, has been designed and built by LeMaire Tool and Manufacturing Company of Dearborn, Michigan.

It consists of two heavy duty spindle quill assemblies on a main base, with



another assembly of the slide type consisting of two spindles at right angles to these mounted on a rear base. All three are actuated by LeMaire No. 5000 Twin Ram Hydraulic Units.

In one cycle, consuming 1½ minutes, two spindles supported by heavy duty quill assemblies approach each other from opposite directions to bore and finish two holes, one measuring 4.001/4.000 and one on the other side measuring 4.876/4.875, in a large truck axle mounting located in a center fixture.

At the same time the rear head moves in at right angles to bore three holes and finish face two holes. One measuring 4.7252/4.7242 and two holes in line just below that measuring 4.9227/4.9217. The boring of the lower holes is done with the caps in place to assure the perfect shape of the holes.

All parts are rough bored and finish faced in one operation at a rate of 40 pieces per hour at 100% efficiency. A second operation is required for finish boring all holes to .001 tolerance.

The spindle quill assemblies are mounted on precision bearings for guiding the boring bars and maintaing accurate alignment.

*INFORM-A-GRAM KEY No. 363-V*

*Increase Production with*

**CURVED TOOTH MILLING CUTTERS**

Woodruff Keyway . . . Plain Mills . . . Staggered Tooth Side Mills . . . R & L Hand Shear Side Mills . . . Overlapping Side Mills.

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**ABER ENGINEERING WORKS, INC., Waterford, Wis.**

**MILLING - DRILLING - BORING ATTACHMENT** *for* **Heavy Duty Operations**

PROMPT DELIVERY

**EASY MOUNTING**

**Large Quill**

**4" Travel**

(counter balanced, hardened and ground)

**6 SPEEDS**

250-3000 RPM

**Lever and Worm Feeds**

**½ H. P. Motor**

Specially engineered by RUSNOK to meet the demand for heavier duty end mill operations. Uses many types of cutters on a wide range of work. Large size spindle (No. 9 B & S taper). Takes ½" to ¾" end mills. Precision Engineered and Ruggedly Constructed Throughout.

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**TUNGSTEN CARBIDE**

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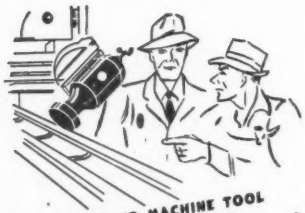

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YES SIR! You can now make your machine a "double purpose" machine, the "Standard Way". STANDARD VERTICAL SPINDLE GRINDERS can be easily mounted on your Planers, Boring Mills, Shapers, Milling Machines, etc., giving you added profits! Available with or without feeds, as preferred.

Write for Your copy of Catalog 43, today.

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TOOLS

This is no time for machines to stand idle, while good tool makers rummage through the scrap heap for setting-up materials or waste vauable time fashioning makeshift setting-up devices. Equip all planers, shapers, milling machines, drill presses and special machines with ARMSTRONG SETTING-UP TOOLS—Planer Jacks, Bracing Jacks, "T"-Slot Bolts and Drop Forged Strap Clamps that reduce setting-up time to a minimum, hold work and jigs rigidly, prevent delays, accidents and spoilage and stand up for years.

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BROS. TOOL CO.
"The Tool Holder People"
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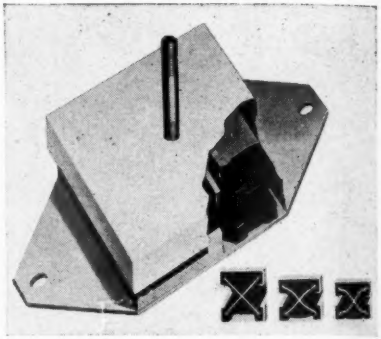
Write for Circulars

## Rexon Vibration Mounts

A new type of vibration mount, characterized by extreme simplicity in design and application and almost indestructible has just been announced by Hamilton Kent Manufacturing Company, Kent, Ohio.

Only two standard Rexon mountings are required to isolate all types of vibration. All a designer need consider is



the total weight and weight distribution and whether the vibration direction is vertical or horizontal. Loading is not critical, a tolerance of 10% plus or minus in weight or weight distribution is permissible.

Rexon uses the damping property of rubber in shear but with no possibility of overloading the elements. This unique property stems from the use of a special "X" type of design of the rubber which acts in shear at the points of the "X" under normal loading but in compression when the load exceeds the rated capacity of the mount. The mounts cannot be damaged by temporary or permanent overload. No rubber-to-metal bonds are used.

The efficiency of any vibration dampening unit is directly proportional to the degree of deflection that occurs in the mount as the load is applied. Independent laboratory tests have established that Rexon mounts have almost double deflection for a given load compared to previous standards. Rexon mounts have no critical frequency points thus eliminating any problem of resonance.

*INFORM-A-GRAM KEY No. C73-V*

RussCo

PURPLE LAYOUT DOPE

*for* Tool . . . Die . . . Pattern or Template Layout and Check Lines on Castings. All lines show up Clear . . . Sharp . . . and well defined.

The best Layout Dope on the market { Gallons . . . . . $ 2.50 / Quarts . . . . . .90

*Buy from the originator. Order direct or from your local supply house.*

**RUSS SIMPSON COMPANY**

**1826 East Congress Street • Detroit 7, Michigan**

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*Tested Tools*

HARGRAVE Chisels and Punches have been recognized for more than 60 years as the finest tools of their type. Each Chisel and Punch is Triple-Tested for hardness, toughness and freedom from flaws. As a result, they last longer, cut faster, give better service.

WRITE FOR CATALOG showing complete line of HARGRAVE *Individually Tested* Clamps, Chisels, Punches, as well as Washer Cutters, File Cleaners, etc.

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*The* **CINCINNATI TOOL** *Co.*

HIGHEST QUALITY "ANCHOR" CHROME CLAD STEEL TAPE

**LUFKIN**

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TAPES • RULES • PRECISION TOOLS

**MINN-KOTA TAP GRINDING TOOL**

**With HOLDING Fixture for Bench Grinder**

**This inexpensive equipment quickly saves its cost. You can regrind old, worn taps repeatedly and make them cut like new again. Grinds any desired chamfer and relief uniformly on all flutes of plug or taper taps, right or left hand. Send for circular.**

Fixture adjustable to fit any bench grinder

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PRK - 33
COBALTCROM
Air Hardening, Non-Deforming
Cobalt High - Carbon,
High Chromium Steel

A tool steel with an original basic formula of our own specifications. Recognized for long die life and unsurpassed quantity production runs.

Outstanding characteristics are simplicity of treatment, uniform hardness penetration to the center, secondary hardness, extremely high tensile strength, resistance to abrasion.

Ideal for blanking, drawing, forming, trimming, and shearing tools.

Furnished in Bar Stock, Billet, Forging, Casting and Welding Rod.

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DARWIN & MILNER Inc.
*highest grade tool steels*
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**TO MANUFACTURERS SEEKING AN EXPORT MARKET**

Leading American Foreign Trader with record of 50 years successful operations in foreign markets is seeking additional lines of important American producers industrial, farm, transportation machinery and machine tools for distribution throughout the Orient and Latin America.

Head sales office for Latin America is established in Buenos Aires. Prewar connections in the Orient will be immediately re-established when conditions permit. Sales agencies under guidance of experts experienced in each market.

If you are seeking clean aggressive representation write us details of your products for both immediate and postwar selling. If interested we will have a representative call on you for further discussions.

**Box AP-25, Tool & Die Journal**
**460 Fairmount Blvd. Cleveland 6, Ohio**

## New Surface Inspection Method

A new method of reproducing surface finishes of materials, in third dimension, so that they can be shown on any projector, has been developed by Rex D. McDill, 5109 Mayfield Road, Cleveland, Ohio. The new material which is used in this process, Faxfilm, is a specially-compounded plastic film, which is pressed onto the surface to be reproduced after coating the surface with a solvent. The Faxfilm is then peeled off and mounted in a frame for projection. Faxfilm, it is claimed, will show details of the finest irregularities up to .0001, at a small fraction of the cost of a photomicrograph. Since it is non-inflammable and will withstand high heat without distortion, Faxfilm can be used with high powered projectors.

This new material has proved to be useful to die and toolmakers in checking surface finishes, to metallurgists for determining grain flow, in process control spot checking, and in the checking of surfaces for cleavage, cracks, porosity, dents, scratches, or corrosion. *INFORM-A-GRAM KEY No. C63-V*

## New Patents of Tooling Interest

(*for obtaining, see page 168*)

METHOD OF MAKING METALLIC PRODUCTS OF SHEETLIKE FORM, No. 2,348,178.
BRIQUETTING PRESS MOLDING PROCESS, No. 2,348,197.
CUTTING TOOL, No. 2,348,262.
ANGLE TOOLHOLDER, No. 2,348,266.
MACHINE FOR GRINDING RACKS, No. 2,348,281.
GRINDING WHEEL DRESSER, No. 2,348,354.
TURRET INDEXING MECHANISM, No. 2,348,363.
TURRET ACTUATING MECHANISM, No. 2,348,364.
METHOD OF MAKING PRESS STRUCTURES, No. 2,348,403.
PORTABLE RECESS CUTTER, No. 2,348,406.
PRESS AND THE LIKE, No. 2,348,439.
THREE-DIMENSIONAL PANTOGRAPH MACHINE TOOL, No. 2,348,632.
AUTOMATIC SCREW MACHINE, No. 2,348,657.
GEAR TESTING MACHINE, No. 2,348,712.
TOOLHOLDER, No. 2,348,727.
METHOD OF ARC WELDING, No. 2,348,728.
GEAR CUTTER, No. 2,348,759.
MEANS FOR TESTING HARDNESS OF MATERIAL, No. 2,348,782.
DIE ASSEMBLY, No. 2,348,799.
EXPANSIBLE CHUCK, No. 2,348,819.
GEAR SHAVING HOB, No. 2,348,844.
OILHOLE DRILL, No. 2,348,874.
THREAD GRINDING MACHINE, No. 2,349,477.
SWAGING TOOL, No. 2,349,493.
MICRO BORING AND TURNING DEVICE, No. 2,349,503.

*For that "Second Wind" In War Production*

**DRILL TINY HOLES from .004 to 5/16" diameter**

The HAMILTON MUEHLMATT Super Sensitive DRILLING MACHINE

**Let the Hamilton Drill help the crying need for precision drilling faster and more of it. Designed for most efficient drilling—super-sensitive—on instrument panels, Diesels, airplane and other important jobs.**

*WRITE FOR BULLETIN V*

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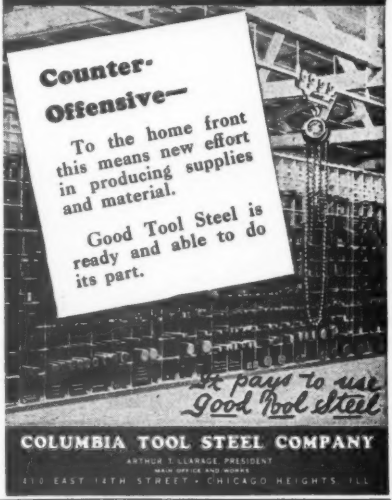
Ninth and Hanover Streets.
HAMILTON OHIO

**NEW UNIVERSAL GREENFIELD GRINDER SPEEDS TOOL AND CUTTER GRINDING**

**The rugged GREENFIELD No. 4 Tool & Cutter Grinder is serving industry as an invaluable production and toolroom machine. The spindle design of the new and improved GREENFIELD Wheel Head incorporates generous bearing areas—scraped to fit and thoroughly run in. Quickly and easily set up attachments provide toolroom versatility for grinding formed cutters, taper and rose reamers, flat surfaces and compound angles. Send for detailed and illustrated job application bulletin.**

PRODUCTION MACHINE CO.
GREENFIELD, MASS.

**Columbia TOOL STEEL**


Counter-Offensive—
To the home front this means new effort in producing supplies and material.
Good Tool Steel is ready and able to do its part.
It pays to use Good Tool Steel

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*A REAL HELPING HAND*

**It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.**

**The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in 3/16" to 1" diameters.**

*Send for price list.*

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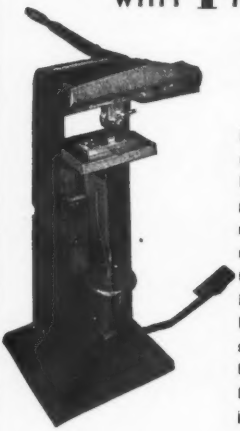
*Mark* ROUNDS OR FLATS
WITH 1 MACHINE



GOTTSCHO
INDENTA
NO. 65

Handles many unusual and practically all run-of-the-plant marking and numbering jobs on metal. On pedestal model, tooling is quickly and easily changed so that same assembly may be used for marking flat or cylindrical parts.

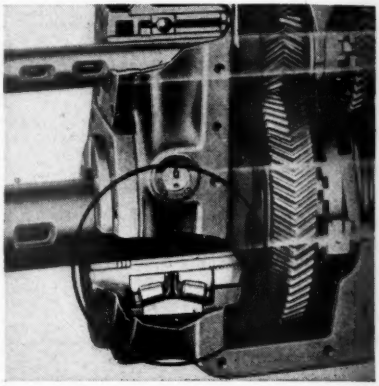
*Send for Data Sheet No. 18*

MARKING EQUIPMENT
ADOLPH GOTTSCHO, INC.
190C DUANE ST NEW YORK 13 N.Y.

## Tool Steel Tubing

Tool steel tubing, often employed to save time and cost in the manufacture of blanking and forming dies and tools, is now being used for bearings, heavy-duty bushings, sleeves and other machine tool parts.

The Giddings & Lewis table-type milling machine headstock incorporates main spindle sleeve bushings made of tool steel



tubing in order to provide and maintain a close fit between the spindle and the spindle sleeve. Two bushings are used, their internal bores being ground after they have been inserted in the sleeves.

Tool steel tubing was chosen for this job, replacing bronze bushings in order to prevent excessive wear and maintain the necessary close fit over a long period of time. It has proved more successful for this job than any other material, and has practically eliminated galling.

Little change in design was required in the replacement, the only change being in the direction of simplification, because it was possible with tool steel tubing to use straight bushings and eliminate a take-up device which had been necessitated by the bronze bushings, which were tapered.

No difficulties have been experienced with the tool steel tubing bushings and replacements are an exceptional occurrence according to the Bissett Steel Company, 945 East 67th Street, Cleveland 8, Ohio.

*INFORM-A-GRAM KEY No. 603-V*

# "STAR DUST"

LABORATORY GRADED

PURE DIAMOND POWDERS

STAR DUST speeds up production enormously and produces finishes and superfinishes down to less than .0000004 of an inch.

Precision LAPPING POWDERS for PRECISION work

For GAUGES, TOOLS, DIES, etc., with tremendous TIME SAVING. These factors make STAR DUST indispensable in lapping and superfinishing on HARDSTEELS, TUNGSTEN CARBIDE, CHROME.

- Absolute control of particle sizes
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*There is a STAR DUST Field Serviceman in your territory.*

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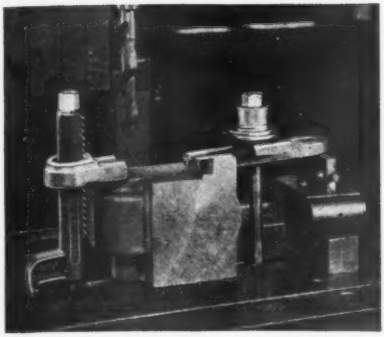

TAKE A LOOK

**THIS?——OR——THIS?**

Clamping methods for holding work to the machine table have been improved. Howell adjustable high speed work clamps are practical in every sense of the word and needed in every machine shop.

Send for descriptive literature describing these unique clamps.

**HOWELL CLAMP COMPANY**

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*first,* use good diamonds, properly set.

*follow* with proper use — not abuse.

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"UTILITY" Pneumatic GRINDER

A powerful, fast-cutting tool, streamlined in design, easy to handle. Designed for real production work and the toughest jobs. Precision made, excellent balance. Special grease-sealed bearings . . . no lubrication required. Fitted with steel housing, a special safety feature.

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ALL-PURPOSE

Inspection Lamp

Extremely versatile, the new Opaskope Inspection Lamp not only illuminates objects placed on its stage, but its light can also be sent in any other direction. A friction swivel makes it adjustable to any height or angle.

The light delivered is cool — important when living or delicate tissues are observed. Its highly corrected spheric and aspheric lens combination produces a powerful, concentrated beam of light, free from chromatic aberration. Size of spot is controllable.

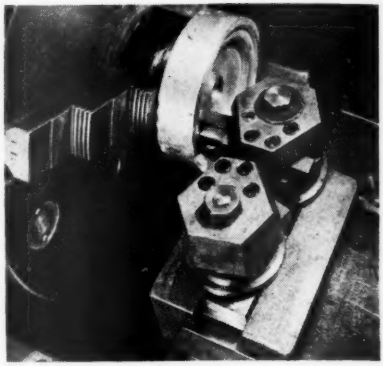
*Write for Bulletin OL-294*

FISH-SCHURMAN CORPORATION
230 East 45th Street, New York 17, N. Y.

Fish-Schurman

## Sturdy Tool Holder

A new and practical carbide tool holder incorporating a main bolt to both lock the adjustment and secure the holder to the machine has been developed by Howard Dearborn, Inc., 3370 W. 140th St., Cleveland 11, Ohio. Set screws give positive locking of two tools in a large tool slot. The head is hardened to prevent wear. A knurled nut permits adjustment of the tool to the working height. The T-slot anchor is made to fit the cross-slide of the machine. This is a rigid holder that can be placed close to the work with a minimum of overhang of the tool which eliminates the chatter common to less compact tool holders. The Howard tool holder is easily adjusted to height without the use of blocks or shims and once adjusted, the tool can be removed for grinding without losing the original setting. Its value has been proved where greater production is required. The holder can be used for a double facing and chamfering operation, a forming and facing job or turning and forming can be done in one operation. With one setup of two holders and four tools several operations can be done at one time. The applications of the holder are limited only by the "know-how" of the operator.



Sizes and specifications are: tool slot from ⅜" to 1¼", head diameter from 1½" to 5", height from 1¼" to 10". Height adjustment ranges from ⅛" on small holders to 1" on the large holders.

*INFORM-A-GRAM KEY No. C68-V*

## "ADJUSTABLE" HOWARD CARBIDE TOOL HOLDER SAVES PRODUCTION TIME AND MONEY

*Solid—Compact—Long Life!*

**Minimum overhang!** prevents tool chatter. Knurled nut height adjustment—No blocks—No shims—No rockers!—Tools can be removed for grinding without losing the original setup! Standard sizes available for lathes and screw machines. Hex or Square Heads. Send for bulletin CH.

**HOWARD DEARBORN INCORPORATED**

3370 W. 140 STREET, CLEVELAND 11, OHIO

Distributors Wanted

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*Please send us____copies of Trig Tables.*

*Enclosed is $_____in payment.*

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Patent Applied For

EVERY MAN can now sharpen a drill right like a veteran mechanic—with help of this new device.

**SAVES TIME—PATIENCE and DRILLS**

GET this new device, learn to use in 10 minutes, grind drill right first time and watch drill cut through steel or iron like you've always wanted to!

*Order Now!* $1.35 postpaid; $1.50 C.O.D.

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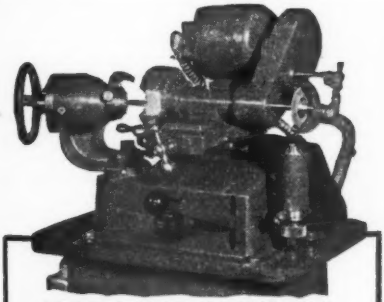

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- *Fast—easy to operate.*
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**HEADS ONLY AVAILABLE FOR USE ON UNIVERSAL TOOL & CUTTER GRINDERS**

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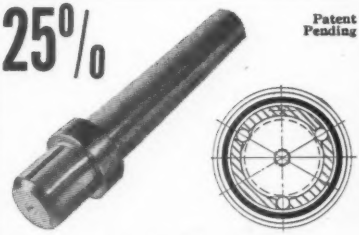

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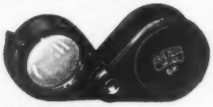

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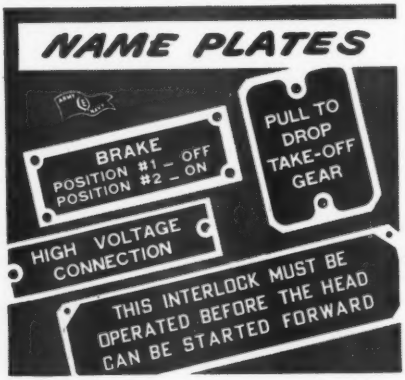
BRAKE
POSITION #1 — OFF
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PULL TO DROP TAKE-OFF GEAR
HIGH VOLTAGE CONNECTION
THIS INTERLOCK MUST BE OPERATED BEFORE THE HEAD CAN BE STARTED FORWARD

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The first series consists of 9 blocks .1001" to and including .1009" in increments of .0001". The second series is 9 blocks .101" to and including .109" in increments of .001". The third series is 9 blocks .110" to and including .190" in increments of .010". The fourth is 5 blocks .100" to and including .500" in increments of .100". The fifth is 3 blocks, 1.0", 2.0", and 4.0".

These blocks when wrung together give an overall measurement of 11.7995", hence any measurement from .050" to 11.7995" in increments of .0001" can be made with "millionth" accuracy, using various blocks in combination. The gage blocks are available in two qualities, set "A" (Inspection Quality) is guaranteed in height, flatness and parallelism to an accuracy of within plus or minus .000004" at 68° F, while set "B" (Working Quality) is, in the same manner, guaranteed to within plus or minus .000008".

*INFORM-A-GRAM KEY No. 696-V*

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To sell a complete line of inspection and working gages, small tools and small jigs and fixtures. Exclusive territory on straight commission basis. Statement of availability required. Write stating qualifications. Box C-245, c/o Tool & Die Journal, 2460 Fairmount Blvd., Cleveland 6, Ohio.

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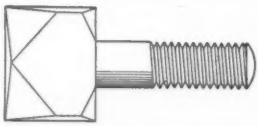

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**DIES**

**INVOLUTE SPUR GEAR CUTTERS**
**14½°; 20° & 25° P. A.**

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**Clinton, Indiana - Phone 85**


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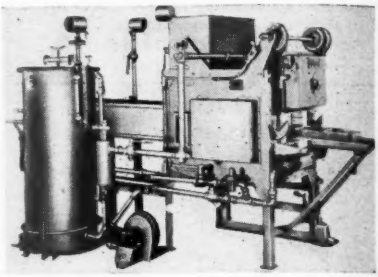

metallurgy, bright annealing, general and high speed tool hardening.

Unusual flexibility of use results from its wide range of working temperatures of from 1300° F to 2500° F. The construction of this new furnace permits the handling of heavy loads at high temperatures, making its use especially efficient for the sintering of powdered metals. Handling work in and out of the furnace has been made easier by the use of efficiently designed loading and unloading platforms. Furnace shutdowns are forestalled by the use of globar type heating elements that are quickly replaceable.

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*INFORM-A-GRAM KEY No. 369-V*

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*(for obtaining, see page 168)*

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## From 7 to 84 Pieces per Sharpening . . . by *Cold Treating* in a *Deepfreeze* Industrial Chilling Machine!

***Deepfreeze Cold Treatment Cuts Costs by Increasing Tool Life . . . Increases Production by Cutting "Down Time" of Machines on Vital Operations***

The value of applying Deepfreeze cold treating to increase cutting life of small tools is exemplified by the experience of this manufacturer. In tapping tank drive gear parts it was found that after machining a relatively few pieces, the crest of the ½" pipe tap burnished or the tap chipped on face of thread. This made frequent sharpening necessary, proved extremely costly and slowed production considerably.

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Photomicrographs taken both before and after treatment showed that the cold-treated tap had a much finer Martensitic structure with little Austenite. Rockwell "C" Scale hardness of the metal was increased from 64 to 65½. Actual tests revealed that over 84 pieces could be tapped per sharpening with the cold-treated taps against 7 pieces average for untreated taps...for an *increase in tool life of 1200%*.

In addition, the quality of the work with the cold-treated taps more closely adhered to air corps specifications for thread-smoothness and accuracy. Machine 'down time" was also perceptibly decreased.

### FREE... Complete Cold Treating Data

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Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

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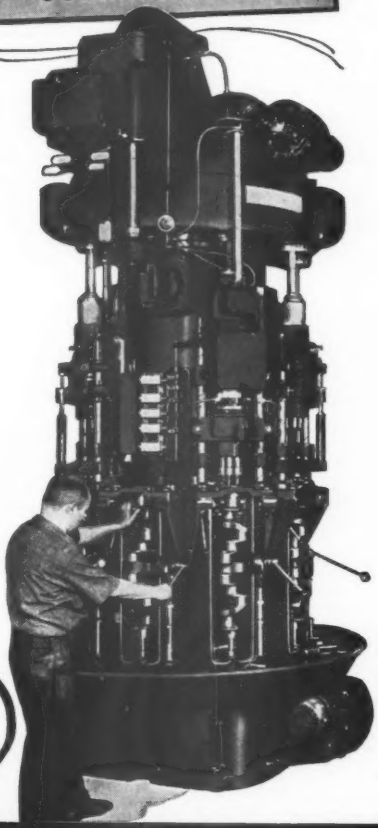
# *Still another* PRODUCTION INCREASER

## *Special Delivery* FROM SOMMER & ADAMS



### 8-SPINDLE ROTARY INDEXING DRILLING, REAMING, TAPPING MACHINE

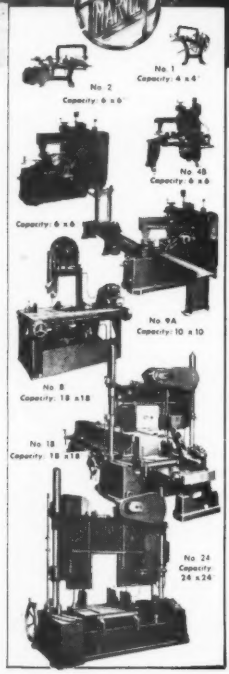
Still another example of special design by Sommer and Adams to fill a special purpose — an 8-spindle machine, central column type, with multiple heads for drilling, tapping, countersinking and reaming holes in crankshaft flanges. Operation is entirely mechanical and electrical. Heat-treated drive gears, hardened and ground worms, and hard bronze worm gears suggest superior materials and workmanship. A machine that gives production plus accuracy.

***The Sommer & Adams Co. places at your command a 25-year acquaintance with the intricacies of special machine design and construction.***

THE SOMMER & ADAMS COMPANY

18511 EUCLID AVENUE • CLEVELAND, OHIO

*Custom-Built* EQUIPMENT FOR MANY PURPOSES




## Keep 7 Steam Hammers Supplied with Forging Steel

At the Cicero plant of the **Atlas Forgings Company**, two **MARVEL** No. 9 **High Speed Hack Saws**, equipped with heavy duty work handling equipment, keep 7 steam hammers supplied with forging steel. The Atlas Forgings Company (like most of the other leading forge plants of the country that have accepted **MARVEL Saws** as standard) have found that the hack saw method of cutting steel **TO EXACT WEIGHTS** is far more efficient and economical than with any other method formerly used by the industry.

With these two **MARVEL High Speed Saws** one operator can keep 7 hammers supplied with **EXACT** Size steel and still have time for other work. The initial investment is small—and the cost per cut is unbelievably low. Contrast this with the old method of cutting-off, requiring an extra heat, frequently with a resultant greater loss of steel.

The **MARVEL Saws** shown above have found special favor with the forging industry and Machine Shops where heavy demands are put on hack sawing machines. This **MARVEL Saw**, with its rugged work handling equipment, will stand up under the heaviest punishment and for continuous 24 hour operation.

**Write for Bulletins**

**ARMSTRONG-BLUM MFG. CO.**

*"The Hack Saw People"*

5700 W. BLOOMINGDALE AVE., CHICAGO 39, U. S. A.

Eastern Sales Office: 225 Lafayette St., N. Y. 12, N. Y.

**MARVEL SAWS**

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